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The JOURNAL OF RADIOLOGY

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X-Ray Spectra Produced Under Various Experimental Conditions*

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I.

RECENT researches in radiotherapy indicate that much can be gained by the employment of penetrating x-rays in the treatment of certain diseases in which the diseased tissues lie some distance below the skin. As a general rule, x-rays of short wave length penetrate through matter farther than x-rays of long wave length do. This does not appear to be the case always. In the following pages I shall give examples in which matter of high atomic weight absorbs short x-rays to a much greater extent than it does long x-rays. In tissues, however, the x-rays ordinarily used carry with them and deposit at a distance below the surface more radiant energy as compared with the amount absorbed by the skin, if they have short wave lengths, than they do if they have long wave lengths. This fact may be ascribed to several causes. Firstly, the primary beam of rays that travel in straight lines from the target of the tube to the diseased tissues below the skin penetrates the intervening tissues more easily, if it contains x-rays of short wave length. Secondly, the secondary, tertiary, etc. radiation that comes from the surrounding tissues, and that constitutes a large part of the total radiation reaching the diseased tissues, bears a greater ratio to the primary beam, if the primary beam consists of short wave length x-rays, than it does if that beam consists of long wave length x-rays. A third reason for employing x-rays of short wave length may be found in the fact that the fraction of the energy of the cathode rays transformed by the x-ray tube into energy of x-radiation increases markedly as the wave length of the rays decreases. Lastly, a much larger portion of the x-radiation passes through the filters, consisting of chemical elements, such as copper, that are employed to cut off the easily absorbed x-rays, if the primary beam contains x-rays of very short wave length.

Since the character of an x-ray beam and the effects it produces at different

points in its path depend upon the wave lengths of the rays it contains, it becomes a problem of prime importance to study the spectra of x-rays produced under various conditions. For deep radiotherapy, in particular, we must determine the best methods of generating very short x-rays, and of filtering out the long ones. This paper contains an account of some experiments on the spectra of x-rays that have passed through certain filters. The first examples illustrate normal absorption of the x-rays, that is, that in which the absorption increases with the wave length. Then follows a case of abnormal absorption, where x-rays of short wave length are cut off by the filter to a much greater extent than are x-rays of longer wave length. Finally, experiments are described on the spectra of x-rays produced by different methods of exciting the x-ray tube. In particular, the spectra produced by a constant, non-fluctuating voltage and by an alternating voltage have been compared with each other.

II.

Before passing on to the experiments themselves, I shall describe the apparatus and the method of investigating the spectra. Fig. 1 represents the arrangement of the apparatus. The x-rays

come from the target, T, of the x-ray tube, and some of them pass through the hole in the brick wall into another room. The second room contains the x-ray spectrometer. Placing the x-ray tube in one room and the spectrometer in another, affords excellent protection for the spectrometer against stray radiation. Protection of this kind becomes exceedingly important, if high voltages are used in producing the x-rays. Additional protection has been obtained by fastening a lead plate one centimeter thick against the wall on the side toward the tube.

The target lies in such a position that the rays that go through the hole leave the target in directions almost parallel to the surface of the target. This is of great importance when a detailed analysis of the spectrum is desired, for under these conditions the source of the rays as seen from the hole approximates to a narrow line. The arrangement, however, possesses certain disadvantages, since the cathode rays produce some of the x-rays at the bottoms of the little indentations that appear on the surface of the target after the x-ray tube has been thoroughly seasoned. The sides of these little hollows and the small protuberances on the target's surface absorb a very perceptible amount of the x-rays. The experiment described

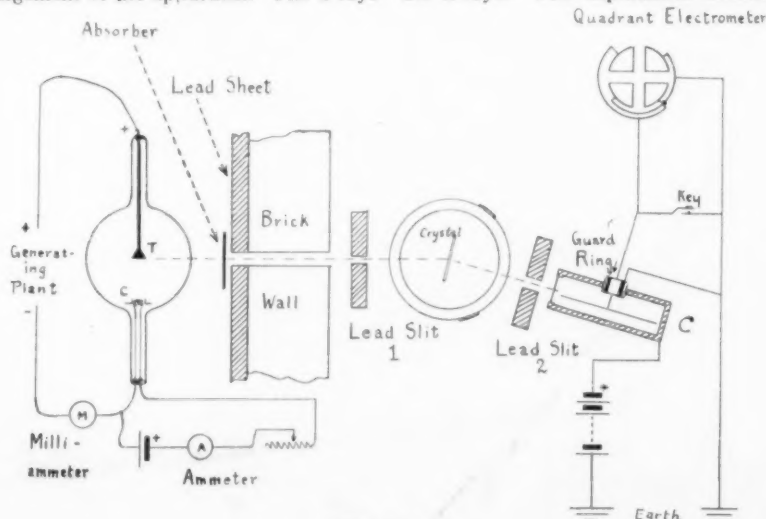


Fig. 1.

*—Read at the annual meeting of The Radiological Society of North America Chicago, December, 1921.

in section three furnishes a good example of this absorption by the target of its own radiation.

After emerging from the hole in the wall the x-rays pass through a thin crystal. In the interior of the crystal (if it lies in the proper position) some of the x-rays are reflected, and deviate from their straight line courses in accordance with the fundamental discoveries of Laue, Friedrich and Knipping. These reflected x-rays pass in turn into the ionization chamber, which, of course, must have been placed in the proper position to receive them. The quadrant electrometer measures the electrical current flowing across the ionization chamber.

For an accurate analysis of spectra slit one should be made narrow, thus defining a narrow beam of x-rays. Slit two should be wide enough to admit the entire reflected beam into the ionization chamber. Secondary x-rays pass off in all directions from the points in the crystal struck by the primary x-rays, but the reflected rays are much stronger than the secondary rays, and come from the crystal in one direction only. This direction makes the same angle with the planes in the crystal on which its atoms lie as does the beam of rays coming through slit one. In other words, the angle of reflection equals the angle of incidence. In accordance with the laws stated by W. H. and W. L. Bragg (who first designed x-ray spectrometers) only x-rays of given wave

lengths are reflected at given angles. The relation between the wave length λ of an x-ray and the angle θ at which it is reflected may be expressed by the equation, $\lambda = 2d \times \sin \theta$, where d is the distance between neighboring planes of atoms in the crystal. In the experiments described in this paper calcite was used as a reflecting crystal, and $2d$ has the value, $2d = 6.056 \times 10^{-8}$ cm. The crystal also reflects x-rays of wave lengths $1/2\lambda$, $1/3\lambda$, etc., but very much less strongly than it does x-rays of wave length λ .

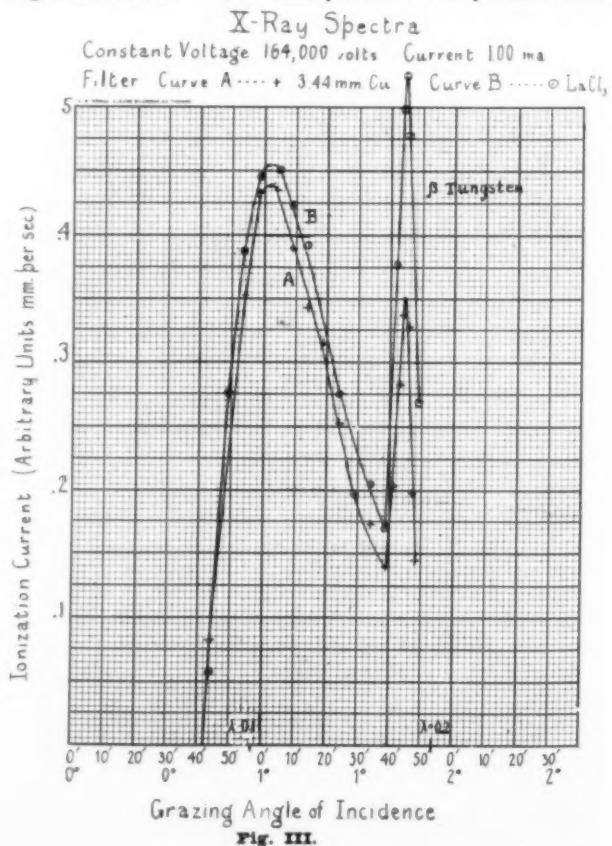
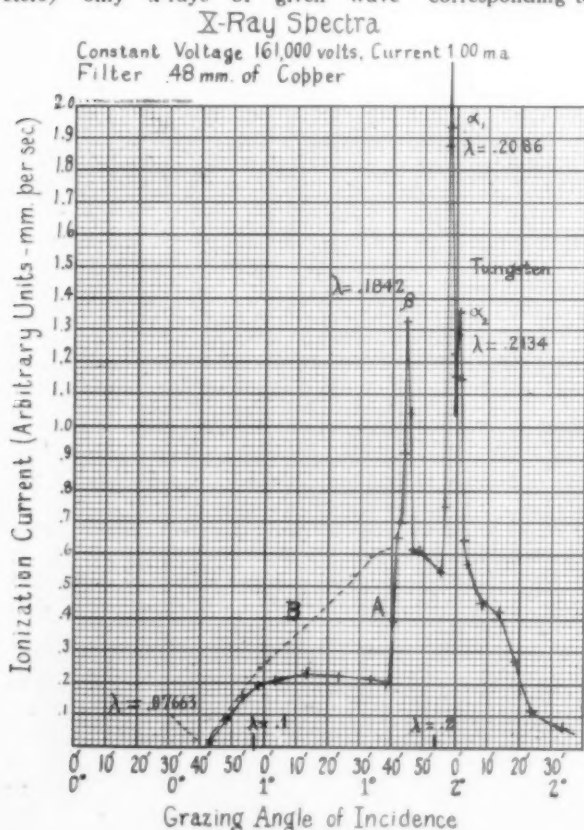
III.

By setting the crystal at different angles (and the ionization chamber at corresponding angles), and by measuring the ionization current for each angle, data may be obtained from which curves may be drawn that represent the x-ray spectra. Fig. 2 contains such a curve. In this experiment a constant voltage of 161,000 volts drove a current of one milliampere through a Coolidge x-ray tube with a tungsten target. The absorber (or filter) consisted of a sheet of copper .48 mm. thick. As the rays all pass through the crystal, however, before they reach the ionization chamber, the absorption by the crystal must be added to the filtration. The crystal used was equivalent to about 1.5 mm. of aluminum.

Several sharp peaks appear on the curve. These represent exceptionally intense radiation at the wave lengths corresponding to the angles marked be-

neath them. Taken together they form the K series of lines in the emission spectrum of the tungsten target. The lines are usually designated by Greek letters. They have the wave lengths $\alpha_1 = .2134$, $\alpha_2 = .2086$ and $\beta = .1842$, when expressed as fractions of an angstrom, the unit of length usually used in measuring wave lengths. One angstrom equals the one-tenth millionth part of a millimeter. Other lines belong to the spectrum of tungsten, but the above three are the only important ones in radiotherapy. The wave lengths of x-ray spectrum lines in general depend only upon the chemical element, or elements, used as a target in the x-ray tube. They do not depend upon the voltage applied to the tube, nor on the current through it, nor on any other experimental condition. Every chemical element has its own set of lines. Their wave lengths may be found tabulated in a report written by the author and published by the National Research Council.

In addition to the peaks the curve indicates the presence of a continuous spectrum containing x-rays of all wave lengths down to the wave length $\lambda = .0766$. At the point marked A a sharp drop occurs. This drop represents the absorption by the tungsten target itself, as explained in section two. The drop appears at a wave length, $\lambda = .1781$, just a little shorter than the shortest of the emission lines. The absorption is of a peculiar kind.



The tungsten absorbs x-rays of all wave lengths, but it absorbs x-rays of wave lengths shorter than the value .1781 to a much greater extent than it does x-rays longer than .1781. For this reason tungsten would not be a good substance to use as a filter, if a beam of short x-rays were desired. Had the surface of the target been very smooth, and had it been turned so that the x-rays reaching the spectrometer came from the focal spot in directions making large angles with the target's surface, this great characteristic absorption by the tungsten would not have occurred. The curve would have lain in some such position as that represented by the dotted line, B. The position of the line B has been calculated on the assumption that the co-efficient of absorption varies as the cube of the wave length, which probably represents only an approximation to the truth.

At its lower end the continuous spectrum has a very sharply defined minimum wave length. The value of this wave length depends upon the maximum voltage applied to the x-ray tube, and on nothing else.⁽²⁾ The relation between the minimum wave length, λ , and the maximum applied voltage, V , may be expressed by the equation, $V\lambda = 12.354^{(3)}$. Equation two may be used to calculate the minimum wave length, λ , produced by a given maximum applied voltage, V , or to calculate the maximum voltage, if the minimum wave length has been measured. A small correction has to be made in estimating the minimum wave length from the shape of the curve. Spectrum curves always appear to indicate voltages slightly in excess of their real values. The correction arises from the fact that the focal spot on the target and slit one in the spectrometer are not mathematical lines. The magnitude of the correction may be obtained from the breadth of a single peak on the curves that represents a single emission line, or, better, from the breadth of the sharp drop in the curve that represents a characteristic absorption. Half of this breadth must be added to the angle corresponding to the point at which the curve reaches the zero axis. The correction ought not to be large. In good experiments it ranges from a fraction of one per cent to several per cent, depending upon the accuracy of the apparatus, etc.

Spectrum ionization curves do not represent the relative intensities of the radiation at different wave lengths. They correspond rather to the relative amounts of energy absorbed in a given quantity of gas in a given time. The same statement applies to photographs. The chemical action in the photographic film comes from the energy absorbed in it. In radiotherapy we are interested

more in the amounts of energy absorbed than in the amounts that pass through the tissues.

The ionization curves, however, do represent both the relative amounts of energy absorbed and the relative intensities of the radiation of the same wave length under different experimental conditions. This point is brought out in the particular examples discussed in the following sections.

IV.

The introduction of absorbers, or filters, in the path of the x-rays coming from the target changes the shape of the ionization curve⁽¹⁾. In other words, it alters the distribution of energy in the spectrum.

The writer, in collaboration with research students, has begun a thorough investigation of various filters with a view to determining their efficiency in producing x-rays with relatively large amounts of energy in the short wave length parts of their spectra. The experiments described in this and the following section serve only as illustrations of this extended research.

The two curves in Fig. 3 represent the spectra of x-rays that have passed through filters of metallic copper and of lanthanum chloride respectively. The constant voltage applied to the tube amounted to about 164,000 volts.

The thickness of the copper filter was 3.44 mm. On comparing the curve corresponding to this filter (curve A, Fig. 3) with the curve of Fig. 2, for which the thickness of copper amounted to only .48, we find a marked difference in the distribution of energy. The 3.44 mm. curve has a pronounced maximum in the neighborhood of wave length, $\lambda = .11$. This maximum is higher than the peak representing the β emission line of the tungsten spectrum at wave length $\lambda = .1842$. On the other hand, the β peak on the curve of Fig. 2, for .48 mm. of copper filtration, is very much higher than the curve at $\lambda = .11$. An accurate quantitative comparison between the curves of Fig. 3 and that of Fig. 2, cannot be made, as the experiments were performed under slightly different conditions. A special experiment, however, has shown that the increase of about three mm. in the copper filtration reduces the intensity at wave length $\lambda = .1$ to about forty per cent of its original value, whereas at wave length $\lambda = .2$, the same increase of filtration reduces the intensity to about five per cent of its original value. This illustrates well the transparency of metallic filters for short x-rays mentioned in section one.

The experiments represented by the two curves of Fig. 3 were performed under identical conditions except the filtration. The curves, therefore, give accurately the relative intensities of the

x-rays at any particular wave length. Comparing them, we find that at wave length $\lambda = .11$ the lanthanum chloride salt was just thick enough to let through three and four-tenths per cent more radiation than the 3.44 mm. of copper did. At the β peak, however, ($\lambda = .184$) the lanthanum chloride let through a much larger fraction of the radiation than the copper did. Hence, a salt composed of a metal of medium atomic weight (such as lanthanum) and a chemical element of low atomic weight (such as chlorine) does not appear to be as good a filter to use for producing short x-rays as a pure metal of fairly low atomic weight, such as copper.

V.

The experiments described in section four illustrate normal absorption, that is, that in which the filter absorbs x-rays of long wave length more strongly than it does x-rays of short wave length. We now come to a case of abnormal absorption, in which the filter produces an exceptionally large reduction in the intensity of the short wave length part of the spectrum.

The curve of figure four represents an experiment with a filter consisting of a sheet of lead .48 mm. thick. The α and β peaks of the tungsten emission spectrum appear on the curve. The curve differs, however, from those of Fig. 3, in that a sharp drop occurs at wave length $\lambda = .1411$, indicating a marked increase in the absorption by the lead of x-rays shorter than .1411, as compared with its absorption of x-rays a little longer than .1411. Had the lead absorbed the x-rays as the copper did, the curve would have followed some such course as that represented by the dotted line, B, in Fig. 4.

Figures 3 and 4 represent experiments performed under the same conditions except for the filtration. Hence, we may compare with each other the intensities at any particular wave length. On examining the radiation in the neighborhood of wave length $\lambda = .184$ we find that the 3.44 mm. of copper absorbs much more of the x-ray energy than the .48 mm. of lead does. On the other hand, in the neighborhood of wave length $\lambda = .1$ the lead absorbs much more than the copper does. We cannot speak, therefore, of the equivalence of different thicknesses of different substances for absorbing x-rays in general. We can compare the thickness of one substance with that of another which produces the same absorption only at particular wave lengths, or in particular regions of the spectrum.

All chemical elements have characteristic wave lengths at which this normal absorption occurs. At Harvard we have obtained data and drawn ionization curves that determine the posi-

X-RAY SPECTRA PRODUCED UNDER VARIOUS EXPERIMENTAL CONDITIONS—DUANE

X-Ray Spectra

Constant Voltage = 164,000 volts.
Current 1 milliamperes Filter 0.48 mm Lead
Characteristic Absorption of Lead at A

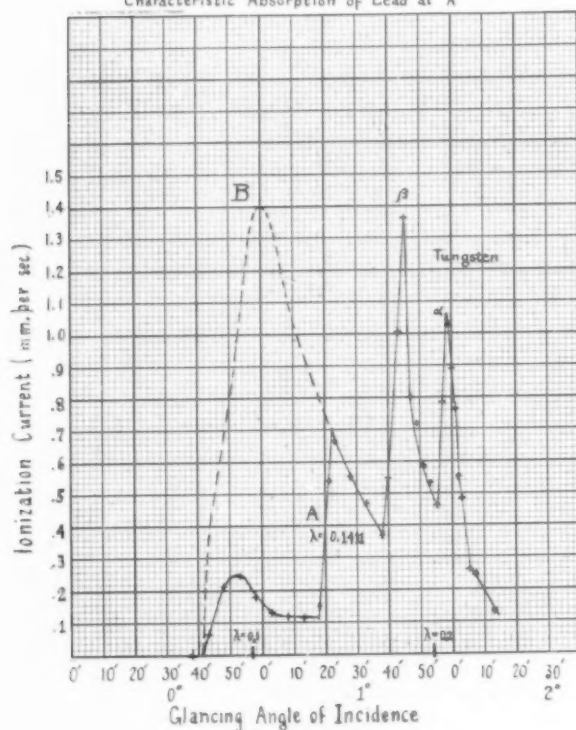


Fig. IV.

tions in the spectrum of these characteristic wave lengths for almost all of the chemical elements. The data may be found in the report mentioned above in section three.

If we desire to produce a beam of short x-rays, we must not use a filter that contains chemical elements, whose characteristic abnormal absorption wave lengths lie in the region of the x-ray spectrum employed. An examination of the tables in the above mentioned report shows that chemical elements of higher atomic weight than that of lanthanum have abnormal absorption wave lengths shorter than $\lambda = .34$. This is the region of the spectrum usually employed in x-ray therapy. Hence, filters containing chemical elements of much higher atomic weight than that of lanthanum should not be used. Tungsten, mercury, lead, etc., have higher atomic weights than lanthanum, and should not be used as filters. For purposes of protection against short, penetrating x-rays, however, such chemical elements are very effective.

VI.

I now wish to take up the question whether the mode of exciting the tube has any effect upon the spectrum of the x-rays. Curve A in Fig. 5 represents the spectrum produced by a constant, non-fluctuating voltage of 164,000 volts. A plant consisting of transformers, condensers, electrical valves, etc., generated the non-fluctuating voltage. In the experiment represented

by curve B an alternating voltage having a maximum value of 164,000 volts produced the x-rays. The same current (1.00 milliamperes) passed through the tube in each case, and the same thickness of copper (3.44 mm.) filtered the rays. A comparison of the two curves shows that the constant voltage produced more intense x-radiation than the alternating voltage did. Further, there appears to be a shift of radiated energy toward the short wave length end of the spectrum in the case of the constant voltage as compared with the alternating voltage. For instance, at the β peak ($\lambda = .1842$) curve A indicates an intensity of radiation about twenty-two per cent greater than curve B does. At the maximum point on curve A ($\lambda = .11$) the constant voltage produces about sixty-six per cent more than the alternating voltage does. Finally, near the short wave length limit of the spectrum ($\lambda = .85$) the constant voltage radiation becomes more than one hundred per cent greater than the alternating voltage radiation. Thus both the intensity and the penetration of the x-rays through tissues, and through filters of medium or low atomic weight may be increased by using a constant voltage instead of an alternating one having the same maximum value as the constant voltage, other conditions remaining the same. The reason for this appears to be easy to understand. In accordance with the law expressed by equation one, the

X-Ray Spectra

Constant Voltage ---- +, Fluctuating Voltage ---- o
Maximum Voltage 164,000 volts; Current 1.00 ma.; Filter 3.44 mm. Cu

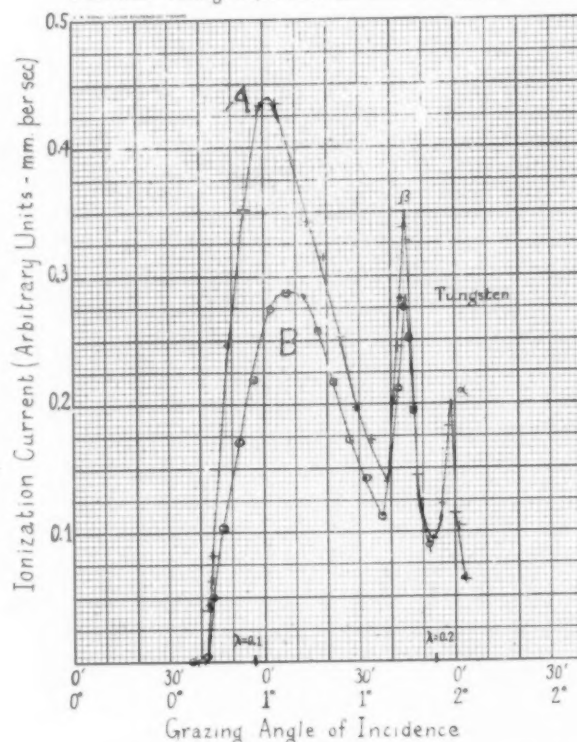


Fig. V.

voltage must rise above a certain value, V , in order to produce x-rays as short as any given wave length, λ , the constant voltage remains above this value, V , and produces x-rays of length λ all the time. On the other hand, the alternating voltage fluctuates above and below the value, V , and produces x-rays as short as λ only a portion of the time.

I have presented curves at scientific meetings showing that at lower voltages the same marked difference between the two modes of exciting the x-ray tube occurs. Other experimenters have found little difference between them in the case of practically unfiltered rays.

The fact that the character of the exciting voltage has so large an effect upon the spectrum of filtered x-rays, becomes of great importance in connection with the estimation of dosage. A measurement of the maximum voltage, the current through the tube and the filtration does not suffice to determine either the intensity or the penetration of the x-rays. In case of heavy filtration one may make errors amounting to several hundred per cent by such a procedure alone.

The safest plan appears to be to examine the spectrum of the x-rays produced by each type of generating plant.

- (1)—Duane and Hunt, Physical Review August, 1915, page 166.
- (2)—Duane and Hunt, Physical Review August, 1915, page 166.
- (3)—Duane, Palmer and Yeh, Jour. of The Optical Society of America May, 1921, page 213.

James G. Van Zwaluwenburg---A Memorial

Rollin H. Stevens, M. D.
Detroit, Michigan

IN the early hours of Thursday, January 5th, Dr. James G. Van Zwaluwenburg, Professor of Roentgenology in the University of Michigan, lay down his work and passed from our midst, after a brief illness from pneumonia.

The hand of a master in most important work in the broad field of roentgenology has been stayed. The world of science has suffered an irreparable loss.

Dr. Van Zwaluwenburg had been working in roentgenology only some eight years and but few, outside his intimate friends, realize what he accomplished in those few years.

His work on pneumoperitoneum was a rare contribution of great value. His paper on "Pneumoperitoneum of the female Pelvis," and his scientific exhibit at the Annual Meeting, in December, will be remembered as a mile post in roentgen diagnosis. His study of pleural or apical caps as signs of the origin of many cases of tuberculosis in an apical pleurisy is also a valuable contribution. Dr. Van Zwaluwenburg also had accumulated a vast amount of data along other roentgenological lines, much of which he did not consider quite ready for publication. It is hoped his study of this material will not be wholly lost.

"Van," as he was usually called by his associates, was born in 1874 in Ottawa County, Michigan, of Dutch-American parentage. He graduated from Hope College, Holland, Michigan, and after teaching chemistry there for one year entered the University of Michigan and received from there the degree of Bachelor of Science in 1898. The next five years he devoted to chemi-

cal engineering and physics in that university, after which he entered its medical school, acting as a demonstrator of anatomy during his undergraduate years and receiving the degree of M. D. in 1907. The two years following his graduation he was an assistant to the Chair of Internal Medicine at the University of Michigan and then became an instructor in that subject. His previous training eminently fitted him for the work of roentgenology, in which he soon became interested. In 1913 he held the position of Associate Professor in that subject, and in 1917 he was made Professor of Roentgenology of the



Medical School of the University of Michigan. He was a valued member of the American Roentgen Ray Society and of The Radiological Society of North America.

He is survived by his widow, a son and a daughter, to whom we express our sympathy in their great and irreparable loss.

Dr. Hugh Cabot's tribute, as published in the "Michigan Daily," sums up so beautifully and so truthfully what manner of man Dr. Van Zwaluwenburg was that it is quoted here:

"In the death of Dr. Van, the University has lost an invaluable servant, science has lost an important exponent and the world has lost a great man. In his work he demonstrated integrity to a very high degree. Utter self forgetfulness was his, even to success, and the only thing he ever neglected was himself.

"His capacity for organization and his knowledge of business methods were of a grade rarely found in medical men. His previous training as a chemical engineer gave him a broader outlook than is commonly found in medical specialists. Of his scientific work in roentgenology it would be difficult to speak too highly, though his actual publications were few.

"He insisted for himself and others on a degree of absoluteness of demonstration which often made him unwilling to publish work which was anything short of complete. Most catholic in his thinking, he never allowed his theories to become for him facts.

"A keen reasoner, a sharp critic, a good loser and a modest winner, he has left a place in the clinical staff of the Medical School, which it will be utterly impossible to fill. He left the impress of his personality upon all of us, and though he has gone, we shall go forward more steadily and more generously than would have been possible without the inspiration of his example."

In the archives of The Radiological Society those personal attainments which bespoke the man will be held inviolate and his memory remain sacred.

Pelycography---Its Field and Its Limitations*

JAMES G. VAN ZWALUWENBURG, B. S., M. D.

Ann Arbor, Michigan,

From the Department of Roentgenology, University of Michigan

AFTER an experience of nearly one and one-half years with the method of pneumoperitoneum as applied to the examination of the female pelvis, it seems that the time has come to attempt to evaluate the method, circumscribe its field and define its limitation. This is the more necessary because of the gloomy picture drawn for us in the report on this subject which was read before the Washington meeting of the American Roentgen Ray Society last September and the conclusions of which, it seems to us, are not entirely just when one considers all the conditions as well as the few facts.

In attempting to estimate the value of any method of examination, one must assume as of the first importance the welfare of the patient. A method is valuable in just so far as it contributes information which can not be so well obtained otherwise and which contributes to the proper treatment of the case without adding disproportionately to the dangers, discomforts, or costs. In the comparison of any two methods of investigation, it is unfair to contrast simply the dangers of the two methods; it is necessary to examine as well the relative funds of new information that one may hope to gain as compared with the risks involved under comparable conditions of experience. It is unfair to compare the four reported deaths which have occurred on attempting to introduce gas into the peritoneal cavity with the mortality of the highly perfected technical methods of the exploratory laparotomy because of the element of inexperience in much of the work done by the newer method. It would be more nearly fair to compare

the early results of laparotomy with the data from a comparable period of the newer method. It is quite possible that experience with the knife and with surgical asepsis does not in itself qualify a man to wield a lumbar puncture needle in an attack on the peritoneum; in the one case a man is guided by the eye, in the other he must depend on other senses, such as touch and resistance. If it can be proven that the danger is not serious and that no serious disturbances result from the presence of gas in the peritoneal cavity, it should not be impossible to avoid injury to the abdominal organs through the development of a suitable technique.

This appears to us not hopelessly difficult when we consider the vast experience of animal workers. Our own observations of the awkwardness of the beginner make it quite comprehensible that accidents should have happened. It is, to be sure, a surgical procedure and should not be lightly undertaken by one who is not well grounded in aseptic technique, but it is probably safer in the hands of an experienced non-surgical man than in those of the skilled general operator without special experience. It may be compared with anaesthesia; far safer in the hands of a well trained nurse than in those of a senior medical student.

Moreover, who has ever seen a purely "exploratory laparotomy?" Is it not against human nature to expect a surgeon with an established reputation to undertake such an operation with the expectation of establishing the absence of pathology? He will not operate unless he expects to find something wrong which he can right and one cannot expect him to desist without making good his judgment by removing something, if only an impertinent appendix. And in the computation of risks of such a purely exploratory operation, how are we to discriminate between the mortality (not to mention the morbidity) due to the exploratory element of the procedure as distinct from the corrective surgery that accompanies it?

It seems to us, therefore, that a direct comparison between the two methods, such as was attempted, is not justified. On the other hand, the proponents of the gas inflation method are under clear obligations to demonstrate not only that it is less dangerous than exploratory operation, but that it is much less dangerous. For it is obvious

that the imperfect image produced by the x-ray can not be expected to furnish as much information as can be derived by direct inspection and handling of the diseased organs. The danger must, therefore, be at least as much less as the information is less reliable.

The demonstration of such a degree of safety is not yet possible and it will not be possible until the method has been in use longer, until its dangers are appreciated, measures have been devised to obviate them, and the statistics of many experienced men are available for study.

From the University Hospital we are now able to add considerably to the list of cases in which pneumoperitoneum has been applied as a diagnostic measure. Up to date something over three hundred and fifty cases have been inflated; some by the transuterine and some by the transperitoneal routes. So far no harmful effects of any kind have been seen. We have managed to avoid puncture of solid or hollow organs, and by the simple expedient of observing that no blood escapes from the needle on removal of the obturator, we have insured against injecting gas directly into the circulation. I am convinced that inexperienced operators have on more than one occasion introduced one thousand cc. of pure carbon dioxide into the subcutaneous panniculus, but no more than a local and very transient interstitial emphysema has resulted. We offer as an explanation of the relative harmlessness of this accident the extraordinarily rapid absorption of this gas. Of course, the only excuse for such an occurrence is inexperience.

The introduction of gas by way of the uterus is free from the objections ordinarily raised against abdominal puncture. There is, on the other hand, the theoretic danger of carrying infection along the tubes and into the peritoneal cavity and the danger of inducing abortion in unsuspected pregnancy. These dangers can only be avoided by the judicious selection of cases. The gynecologist in charge of this work is insistent on the greatest caution, and every inflation is preceded by a thorough clinical examination. If there is any suggestion of a purulent discharge from the os or the history of a skipped period, the transperitoneal route is selected. I can only say that neither of these complications have appeared in our series. The infected tube has al-

*--NOMENCLATURE

A convenient and distinctive terminology for the processes and products of this examination is badly needed. The completely descriptive term "pelvic pneumo-peritoneo-roentgenography" is recommended only by the accuracy of its description. "Pelygraphy" has been suggested but is objectionable because it is not euphonious, because it is not distinctive, being liable to confusion with the process properly called "pelography," and because it combines both Latin and Greek roots in the same word.

We suggest the use of the equivalent Greek root "pelyco-" (from Πελυξ a basin, the pelvis), thus: "Pelycography and "Pelycogram." These are etymologically correct, distinctive, simple and euphonious in all their combining forms.

**--Read at the annual meeting of The Radiological Society of North America, Chicago, December 7, 1921.

ways been effectually blocked and the unsuspected pregnancy has not materialized.

Dr. Peterson naturally prefers the transuterine route because of the added and valuable information it furnishes as to the condition of the tubes and its bearing on the causes of sterility. This is information that can not be obtained in any other way. If the attempt to inflate by this route fails or if there are contraindications, he has no hesitation about attacking the belly wall, confident that in his experienced hands and in those of his assistants the dangers are negligible.

Of the three hundred and fifty cases examined, one hundred and fifty-three have been confirmed, either by operation, or, in the case of pregnancy, by the test of time. These one hundred and fifty-three cases have been tabulated and studied with reference to the correctness of our readings and the causes of our failures. In all cases our readings have been made without the knowledge of the clinical history or the results of bimanual examination, and our conclusions have been drawn from the evidence of the stereoscopic image alone. This is an unnecessarily severe test of the possibilities of the method if one considers only its value to the gynecologist. Many, if not most, of our most serious errors would have been avoided had we had some information before hand. It seems important, nevertheless, to test the unaided possibilities of the method for recognizing anatomical changes and the interpretation of the meaning of these changes in terms of pathology. As a matter of fact, these readings have always been open to review with the gynecologist and a joint opinion reached in all cases of conflict before the patient was subjected to operation.

At first, during the experimental stage, the method was used rather promiscuously in all manner of con-

ditions and with numerous technical variations. From the technical side, it is interesting to note that in the arrangement of a suitable table the tube was for a time placed below the patient for reasons of convenience. Much to our surprise, we found the results were not equivalent to those to which we had been accustomed. It was found almost impossible to satisfactorily project the pelvic floor, and since this shadow was an important factor in the differentiation of several conditions as we had learned to know them, we were obliged to abandon the idea. We explain this difference in the images by the fact that the pelvic cavity is approximately cone shaped. The bundle of rays falling from above passes nearly in the plane of the floor of the pelvis, but the rising ray meets it at a rather broad angle. The projected images are, therefore, quite different. For these reasons we have returned to the original overhead position of the tube.

We early learned that the most important feature in the technique is the inclination of the patient to the horizontal. The uterus is seen only by virtue of the surrounding gas. In order that its entire perimeter may be projected, it is necessary that the uterus hang freely suspended from the floor of the pelvis and that the ray fall vertically in the axis of the uterus. The proper inclination is, therefore, important. Unfortunately, this position can not always be attained, since many women have not the necessary lumbar lordosis and others have lost the flexibility of the lower spine through chronic inflammatory processes. Practically every case must be studied individually to secure the optimum results.

The necessity of emptying the bladder and colon need only be mentioned to be appreciated.

It soon became apparent that it was unreasonable to expect to add anything

to the information of the gynecologist concerning those large tumors which are clearly of pelvic origin and present palpable masses in the abdomen. The pelvis is invariably so filled with the mass that proper inflation and differentiation of the structures that are not displaced by the mass and that remain in the pelvis is impossible. On the other hand, the confirmation of the opinion of the gynecologist that an obscure abdominal mass is not of pelvic origin and the identification of such masses as omental cysts, renal, and splenic tumors, is of at least academic interest and serves to demonstrate the possibility of the method. In more than one case the otherwise inevitable operation has been avoided.

Several cases of advanced pregnancy have been subjected to this examination with interesting and characteristic results. It is obvious that in the uncomplicated case there is little prospect of adding to the information which the obstetrician can command and the method can not be defended as contributing to the welfare of the patient. However, the demonstration of a dermoid cyst and a pelvic abscess in the presence of normal pregnancies is of rather more than academic interest and represents a distinct contribution to the diagnostic data. Both of these conditions have fallen under our observation, and in neither case did harm result from the inflation.

The demonstration of normal pregnancy seems to be least difficult between the sixth and the sixteenth weeks. Before the sixth week the changes are so slight that they will escape observation; after the sixteenth week the fundus has reached the abdomen and is no longer in the center of the field of vision. In the latter case the diagnosis is usually obvious in any case and the examination purposeless.

Experience with ectopic pregnancy has not been altogether happy. This is



Figure I—Nearly normal pelvis. There is a minor degree of traction displacement to the left due to adhesions about the left ovary, which lies on the floor of the pelvis and whose shadow is covered by bowel shadows. Note the normal course of the broad ligament shadow.

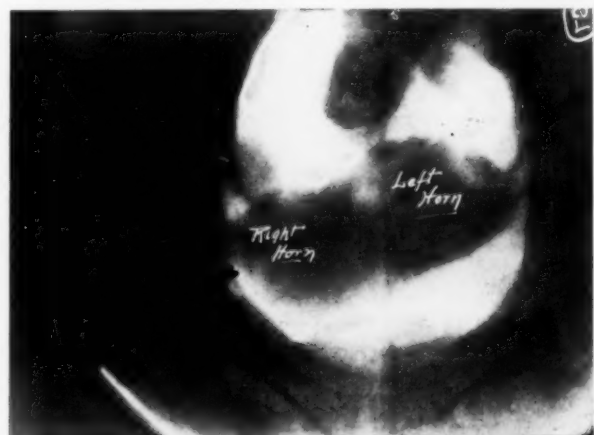


Figure II—Bicornate uterus. The sulcus dividing the fundus also indents the isthmus.



Figure III—Nodular fibromyoma. Note the irregular outline of the fundus and the disproportionate and asymmetrical enlargement of the isthmus. Compare with Figures IV and V.

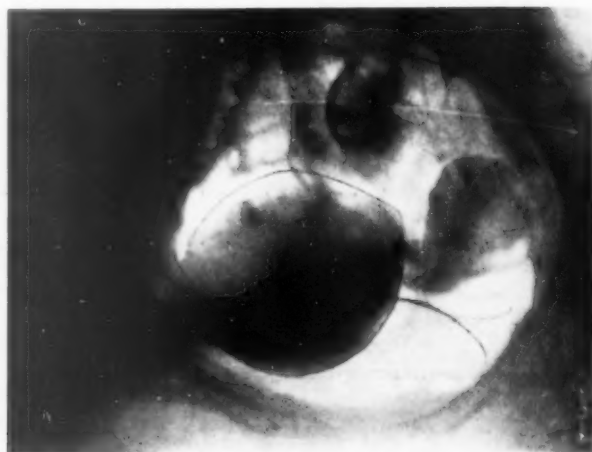


Figure IV—Pregnancy of six weeks duration. The widening of the isthmus in its transverse diameter is well shown. Displacement to the right by ovarian mass on the left whose character has not yet been determined, probably cyst (Retouched.)

principally because the secondary changes which ensue so rapidly lead to confusion with inflammatory conditions. The demonstration of the extrauterine mass is invariably easy, but the proper interpretation of this obvious shadow is difficult. On the other hand, it has twice been our good fortune to have corrected the gynecologist's diagnosis of ectopic pregnancy by demonstrating a normal pregnancy in the normal situation, but complicated by an extrauterine condition.

In supposed pelvic tuberculosis, the method bears in several ways. For instance, the x-ray evidence, unsupported by any clinical findings, led to the removal of a pair of tuberculous tubes. By this means also tuberculosis of the pelvic peritoneum has been excluded as a cause of ascites and diffuse adhesive tuberculous peritonitis has been demonstrated as the cause of pelvic symptoms.

Apart from the demonstration of the patency of the tubes in sterility, perhaps the most valuable contribution is

found in the "negative diagnosis." You are all familiar with the neurotic young woman with a dysmenorrhoea without palpatory findings. The examination may leave the gynecologist unconvinced of the complete normality of the pelvis. There may be a suggestion of minor trouble with the adnexa, the possibility of early pelvic tuberculosis must be considered. The patient particularly dreads anything connected with that name. She demands relief and the "urge" for operation is very great.

If the surgeon does operate, he can always remove an appendix as a justification for the operation in the confident expectation that the pathologist will confirm his suspicions that it is diseased. Or he may incise a few harmless follicles or perhaps do more serious and less excusable damage locally. In any case, he usually establishes a definite "psychic trauma" and confirms the patient in her invalidism. There is the consideration that there is no difficulty in satisfying the patient that something

has been done and the surgeon is the recipient of such credit as may result.

The pelycogram is singularly sensitive to relatively slight changes in the morphology and relationships of the pelvic organs. Minor changes in the size of the ovary, thickening of the tubes, adhesions, fixations, traction distortions; all are shown in striking contrast to the picture of the normal pelvis. Many of these changes will be pronounced of no consequence by the gynecologist and pathologist. It is, therefore, a fairly safe conclusion that the pelvis which appears normal to the sophisticated x-ray eye is in fact without significant pathology. The conscientious surgeon will be glad to leave such patients alone as soon as he is convinced of the reliability of the x-ray method and of the man behind the method.

I regret that the time allotted to me does not permit me to discuss in detail the tabulated results on the one hundred and fifty-three cases, as I had at first



Figure V—Pregnancy, fourteen weeks. Fundus in the lower abdomen represented by a diffuse and inconspicuous shadow with smooth, rounded margin. Conspicuous shadow of the typical lenticular isthmus (Retouched).



Figure VI—Bilateral pus tubes. Few adhesions and no infection of the culdesac. Typical "three ball" shadow. Compare with Figure VII.



Figure VII—Bilateral purulent salpingitis and posterior pelvic peritonitis. Marked retraction of the culdesac with tension distortion of the broad and round ligaments.

intended. The most instructive cases are naturally the "misses" and the detailed discussion of these without an equally full discussion of the "ten strikes" would only serve to give a distorted and fictitiously gloomy impression of the usefulness of this work. A complete discussion of the whole subject is now in preparation.

In the meantime, to my mind, the best evidence of the value of this method and its contribution to pelvic diagnosis lies in the attitude of the Department of Gynecology of the University Hospital under the direction of Dr. R. Peterson. It continues to refer cases in undiminished numbers although the novelty has worn off. The cases are now better selected. The staff is constantly bringing its disputes to the x-ray room for comparison with the stereoscopic image, and they frequently return to the patient with such comments as "We ought to be able to feel that," etc. I am convinced that the method has a distinct field of usefulness in the practice of gynecology as well

as in teaching. That field is not yet clearly defined and its limits can be established only by further experience. It will scarcely develop into a routine procedure or supplant other methods of examination, but I confidently expect to see it occupy an honorable position in the armamentarium of the careful and conscientious surgeon.

Co-operation between the gynecologist and the roentgenologist is imperative. The former will scarcely care to familiarize himself with the laws of projection and stereoscopic vision sufficiently to be independent and the latter can scarcely assume the responsibility of the surgical procedure necessary or the selection of cases.

Such co-operation in unusual measure has been our good fortune. I cannot over-emphasize my obligation to Dr. Peterson and his entire staff in this respect. Their industry is enormous and their interest unflagging. The procedure has been reduced to a routine that is highly satisfactory and we are accumu-



Figure VIII—Hydrosalpinx and haematosalpinx. Some retraction to the left by adhesions. Normal uterus.

lating a mass of data that promises to be very valuable in the near future.

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DISCUSSION

DR. WM. H. STEWART, New York. The doctor has covered the subject so well that I have little, if anything, to add. I would like to say a few words in reference to the general use of pneumoperitoneum. Pneumoperitoneum has come to stay, irrespective of the opinions of some throughout the country. We all know the difficul-



Figure IX—Enlarged, prolapsed and adherent ovary. The retraction is apparent on the flat plate. The fixation to the floor of the pelvis can be appreciated only on stereoscopic examination. No. 39091.

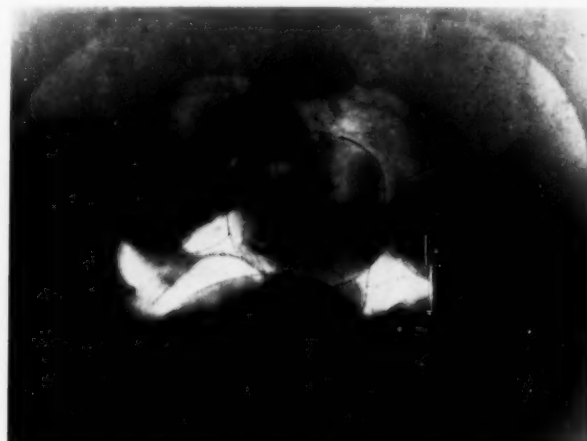


Figure X—Adherent retroversion and retroflexion. Note the shadow of the lower segment reaching forward from the uterine shadow and deforming the pelvic floor. Ovaries enveloped in adhesions (Retouched) No. 39063.

ties that any new method has. I think you can well remember how the man who advocated lumbar puncture was treated for a number of years before the thing was really recognized for its value.

Pneumoperitoneum has its limits and must not be used promiscuously. The cardinal rule to follow is never to use pneumoperitoneum when the same information can be obtained by simpler means. If you decide to use pneumoperitoneum, you must be as careful about the procedure as though it were a surgical operation, and the man who inflates the peritoneal cavity must be as competent to do so as one who is as competent to do laparotomy.

I do not feel, and never have, that the roentgenologist is sufficiently experienced in that line to be able to do his own inflation. I never assume that responsibility. Dr. Stein does it. I have enough responsibility at my end without assuming that.

There have been a great many throughout the country who have been subjected to this method of examination. I do not know accurately how many. I should say at least two or three thousand. As near as we can ascertain, there have been four deaths which have been ascribed to this procedure. Two of them would seem to be a fault in the technique. One was a puncture of the spleen, as near as I remember it, and another was a septic case. Both were avoidable. The other two could not be ascribed directly to pneumoperitoneum, and were not proven to have been caused by it; there was, however, suspicion, not confirmed by post mortem, that pneumoperitoneum was the cause of death in these two cases.

Granting that is so, I believe that the successful issues would far overcome any such mortality as that. Probably, granting that, two cases in three or four thousand. Certainly in many, many instances, it has avoided exploratory operation. We expect to have it knocked. It will be until it is generally accepted in its proper sphere.

The men who are after it are those who do surgery. I find this right in my own hospital, but I would like to say that one of the most rabid men against pneumoperitoneum, right in my own hospital, who stated in one of his discussions on the subject that he would rather submit a patient to two exploratory incisions than to have pneumoperitoneum done on any case, now refers his patients to me for that procedure.

What most impressed him was in the differential diagnosis between splenic and kidney tumors, by which we were able to say whether he should operate from the back or from the front.

There is a great field for this work. Some of the recent developments are sub-diaphragmatic. This is of particular value in sub-diaphragmatic conditions. An investigation of the esophagus at the cardia, with the addition of a pneumoperitoneum, is going to bring out a detail in that area that has never been accomplished before.

I am sure you all appreciate, those of you who do considerable esophagus work, how difficult it is to say whether a certain case is spasmodic or whether it is due to some organic lesion.

By the aid of the ordinary barium or bismuth mixture, combined with pneumoperitoneum, a detail is provided which certainly is far-reaching in its

value in this particular point. Thank you. (Applause.)

DR. B. H. ORNDOFF, *Chicago*. Members of the Society: I was very pleased, indeed, to hear the splendid remarks of the two preceding speakers. The subject of the use of pneumoperitoneum in connection with examinations of the pelvis, as previously stated, limits somewhat our discussion.

While it is one of the most useful phases in connection with pneumoperitoneum, much could be said of the other conditions that may arise with it.

A recent paper by Dr. Woolston upon a gynecological aspect of work done in the county hospital of this city, corroborates very nicely the paper of Dr. Van Zwaluwenburg. I think, as the previous speaker has said, that the method has come to stay. No criticism which may have been placed upon it recently will have anything to do with it other than to make it a more sound method for our future diagnosis.

The previous speaker discussed some other phases of pneumoperitoneum, of work in which pneumoperitoneum is useful, and I might take the liberty of mentioning one other thing and that is the use of a peritoneoscope in connection with pneumoperitoneum. I feel that before the early work of Doctor Stewart, showing us that pneumoperitoneum could be done without danger, that we have through the peritoneoscope a nice addition to our diagnostic armamentarium.

There are not many cases, perhaps, in which the diagnosis may depend altogether upon the findings from the peritoneoscope, but there are a good many conditions in which it may be used to considerable success. I feel that the question of apparatus to assist in this work has not been sufficiently developed.

Dr. Van Zwaluwenburg showed a very nice arrangement of a table in connection with examinations of the pelvis, but for examinations of the sub-diaphragmatic space, as previously referred to, and for organs where the patient must assume different positions and where the angle of the x-ray must come from different sources in order that we may obtain the best diagnostic view, will require apparatus that is not best adapted for this work.

Many articles have appeared on this subject. It would take considerable time to reiterate the various phases that come to my mind. I would like to close by saying that not only in phases of gynecology, but in abdominal diagnosis in general, there is no doubt that the pendulum will balance very soon, and it will become a thoroughly established method of diagnosis. Thank you. (Applause.)

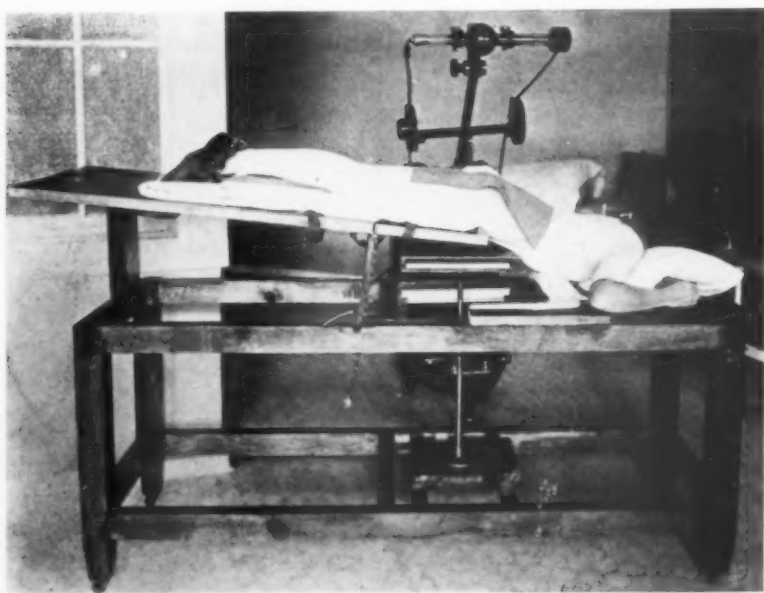


Figure XI—Photograph showing table and position used in making plates of the female pelvis after pneumoperitoneum.

DR. LE ROY SANTE, *St. Louis, Mo.*
I would just like to add our little experience in pneumoperitoneum to that of the former speaker. We have had from one hundred and seventy-five to two hundred cases and no untoward effects from the induction of pneumoperitoneum in any single case.

The difficulties you are liable to get into fall very closely into two or three groups—the possibility of perforating a hollow viscus, the gut, is largely dependent on the pathology you have in the abdomen. If you have a gut that is adherent to the anterior abdominal wall or massive adhesions, then you may have this possibility. If the guts are free, I do not think it possible to insert a needle into the gut. If there are adhesions dense enough to hold the gut to the entry of the abdominal wall while inserting the needle, you do not need to fear if you do insert the needle into the gut.

The next thing is, of course, subcutaneous emphysema. You find the axilla at the side of the neck filled up with air. That does not happen today with the methods of determining when you are inside the abdomen. That causes no ill effect whatever. While we have had it in a few of the earlier cases, we have not encountered it in the last one hundred and fifty cases. The possibility of entering a blood vessel is something that you have to consider.

On one occasion, due to faulty apparatus, and because we did not adhere to the rule of Dr. Stewart to have some one competent to insert the needle, we had bleeding from the end of the needle and the needle was within the abdominal cavity. We withdrew the needle, put the patient to bed and he suffered no ill effects. We gave him another pneumoperitoneum the next day and then operated. There was no bleeding in the abdomen.

PRESIDENT WILLIAMS. Dr. Van Zwaluwenburg, will you close the discussion. A note has been sent to the desk to ask you to explain the technique of the apparatus used in the closing discussion.

DR. VAN ZWALUWENBURG. Answering the note first, do they want the radiographic technique or the technique of the inflation?

PRESIDENT WILLIAMS. The apparatus you use and how you use it.

DR. VAN ZWALUWENBURG. This is obtained from a paper by Dr. Peterson in the last *Journal of Obstetrics and Gynecology*. It is discussed better than I can tell you. The injection is made about an inch below and just to the left of the umbilicus. No preliminary anesthetization is used. A monometer and a gasometer is used to let you know how much we introduce through the belly.

If made in the hospital, a special cannula described a year and a half ago by Dr. Ruben Peterson at the Minneapolis meeting is used with the same preparation, and the limits as to the amount of pressure that can be used are all pretty well discussed in Dr. Peterson's paper. Look for it there.

Now, I can add at least one more case to Dr. Stewart's list of four deaths, not one of my own, but I know there has been a fifth death. There is no use blinding our eyes to the fact that deaths have occurred.

It is also well to remember that a method in comparison with another method must be safe in proportion as we get an inverse ratio to the amount of information we can get. Put it that way.

The exploratory operation may be dangerous, but it is certain to give a

great deal of information that the x-ray cannot give. Therefore, the x-ray man has a clear obligation to prove his method safer than the exploratory method and safer by so much more, as the method is less instructive. Until we can do so, we must leave the question unsettled except in certain cases where, for instance, nobody would think of an exploratory operation, yet he wants definite information for the express purpose of avoiding an exploratory operation. There is a large field for the inflation of the pelvis.

Perhaps the best evidence of the value of the method lies in Dr. Peterson's address. Dr. Peterson is essentially a fairly careful conservative man. He has spent many years in the practice of gynecology. He has a wide acquaintance in the profession and he is going to be pretty careful of his reputation. At first he undertook this purely as an experiment. As things have gone on, he has become more and more enthusiastic, but he selects his cases. We are getting as many cases now as at the beginning. They are more carefully selected.

An interesting feature is that he has lately been compiling the statistics as to the correctness of the gynecological diagnoses, x-ray diagnoses, as compared with the operative findings. It is interesting to note that for the first half of this period the x-ray diagnoses were approximately as good as they were in the last half. The clinical diagnoses, by virtue of the influence of the x-ray, had improved by fifteen per cent. The surgeon, in other words, is reaping the harvest of benefit from this method. We are doing as much of it as before, and Dr. Peterson feels perfectly confident the method is safe in his hands and those of his assistants. The method is dangerous, of course. People might die from puncture of the abdomen.



Pulmonary Syphilis*

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PULMONARY syphilis is a sufficiently rare clinical condition to justify a short resume of the literature on the subject.

In 1822 Morgagni⁽¹⁾ described a condition which he termed "Phthisis Luevenerea" and its cure by anti-syphilitic treatment. In 1853, Depaul⁽¹³⁾ read a paper on "Congenital Syphilis" and gave a good anatomical description of the condition. Two years later Vidal in his treatise on venereal disease devoted some space to pulmonary syphilis. In 1862 Virchow⁽²⁾ reported a case that clinically and later at autopsy showed syphilis of the lung. Fourier⁽³⁾ in 1876, lectured on pulmonary syphilis; and in 1877 Porter read the first paper on the subject in America. During the later years of the nineteenth century cases were reported in the Transactions of the Pathological Society of London by Hutchinson, Pierson and Weber (1891). Up to the present time probably the most complete discussion and bibliography of the subject is that of Beriel⁽⁶⁾ in his article on "Syphilis des Poumons" Paris, 1907.

The rarity of the condition is well evidenced by the following figures: In the study of pathological specimens of the Old London Museum, J. K. Fowler⁽⁴⁾ found only twelve specimens, two of which were questionable. Osler in a report on two thousand eight hundred autopsies at Johns Hopkins Hospital found only twelve cases, eight of which were congenital. In a report of twenty-five thousand autopsies Beriel⁽⁶⁾ found only two cases of pulmonary syphilis, and among four thousand eight hundred and eighty autopsies, three hundred and fourteen of which showed lesions due to syphilis, Symers⁽⁷⁾ found only twelve with a lung involvement; and in a careful review of the literature from 1905 to 1917, Dexter⁽⁸⁾ showed only nineteen undoubted cases of syphilis of the lung reported. In the last ten years, however, with the discovery of the spirochaeta pallidum, the Wassermann test, and the use of the x-ray in the interpretation of diseases of the lung, our knowledge of pulmonary syphilis has been greatly advanced. Many men, particularly clinicians, consider it much more common than we formerly believed; and as Ford Morris⁽¹⁴⁾ effectively states, "the pale spirochaeta nestles and breeds within the tissues of

a large number of people, and pulmonary pathology of syphilitic origin is not so rare as some believe."

Fowler⁽⁴⁾ classifies syphilitic diseases of the lung as follows:

HEREDITARY TYPE—

1. Gummata.
2. Pneumonia.
 - (a) White Pneumonia
 - (b) Interstitial type of Pneumonia.
 - (c) White Broncho-Pneumonia.

ACQUIRED TYPE—

1. Gummata.
2. Broncho-Pneumonia.
3. Chronic Interstitial Pneumonia or Fibroid Induration.
4. Syphilitic Pythisis, a Progressive Destruction of the Lung.

Taking up these subdivisions more in detail:

HEREDITARY TYPE

1. *The Hereditary Type:* White pneumonia is found in the lungs of premature infants who live only a short time. These children are markedly cachectic, and have, on post mortem examination, other lesions of syphilis. The lungs are found to be airless, are increased in size, and show the indentations of the ribs over the parts involved. One or both lungs may be affected and the involvement may be generalized or localized. On section it has a whitish, grayish, or marbled red color, but the granular appearance of typical pneumonia is absent. Microscopically the interstitial tissues are not increased, although the alveolar walls are markedly thickened and the alveoli in the small bronchi are filled with epithelial and inflammatory cells, some of which are in the process of breaking down. In these cases characteristic clinical signs of inherited syphilis are nearly always present.

2. *The Interstitial Type of Pneumonia* is a more advanced stage of the white pneumonia. The lungs are large, hard, dark gray in color and on section show a coarse appearance due to an increase in the interlobular connective tissue. Microscopically there is round cell infiltration, particularly about the small bronchi. The arteries occasionally show luetic arteritis.

3. *White Broncho Pneumonia* is extremely rare, resembles the broncho-pneumonia of other causes except it has a clear white appearance that can be seen and recognized microscopically. It occurs primarily in the small bronchi, the alveoli being involved secondarily.

ACQUIRED SYPHILIS

1. *Gummata:* The gummata are found singly or in large numbers and vary in size from a pin head to an egg. They are usually situated in close relation to large fibrous septa of the lung, especially at the root, less often near the pleura, and rarely at the apex. Gummata of the lung generally become fibrous, rarely they soften and ulcerate into the bronchus. Microscopically the gummata are of the same structure as gummata in other parts of the body. So far as I have been able to find in the literature spirochaetae have not been demonstrated in these gummata.

2. *Syphilitic Broncho Pneumonia* of the second group is held by most authorities to be a doubtful condition.

3. *Chronic Interstitial Pneumonia:* This group comprises those cases in which the fibroid changes are characteristic. The involvement may be local or general. The parts affected are retracted and radiate on the radial lines of connective tissue from the hilus of the lung. If the condition is found localized about the hilus there is a fibrous, syphilitic peri-bronchitis, and an enlargement of the bronchial glands.

4. *Syphilitic Phthisis:* By some this is considered a rarity and by others the most common condition. It is a mixed condition consisting of fibrous tissue formation, gummatous changes, consolidation, cavitation and bronchiectasis. It resembles tuberculosis in every way except that lues tends to affect tissues particularly about the bronchi and hilus of the lung.

In order that a case may be diagnosed as pulmonary syphilis, Fowler⁽⁴⁾ demands: First, that the case must be complete. That is the symptoms during life must be considered in connection with the lesions discovered post mortem. Second, that there be evidence of undoubted syphilitic infection. Third, that tubercle bacilli be absent from the sputum on repeated examination and from the lung tissue on post mortem examination. Fourth, that syphilitic lesions about which there is no doubt will be found in other organs. To these may be added the demonstration of a positive Wassermann reaction and improvement following luetic treatment. From this it will be seen that positive diagnoses of lung syphilis will be few and far between.

CLINICAL MANIFESTATIONS

In hereditary syphilis the lung symptoms are overshadowed by those of the liver, spleen and skin. There may, however, be dyspnea and cyanosis.

*—Read at Omaha and Douglas County Medical Society.

with a difference in the resonance in some part of the chest. Even with energetic antisymphilitic treatment these cases rarely live more than two or three months.

ACQUIRED FORM

A great deal more is known about the pathology of lung syphilis than is known about its clinical manifestations. There may be a latent form in which gummata may be present and give no signs or symptoms. The patient may appear to be in good health and in a good state of nutrition, or may complain of nothing except a slight cough, the physical examination reveal only a slight area of dullness and the x-ray examination show a typical shadow near the hilus of the lung. It would be wise, therefore, considering the accounts of cases that have been reported, to view with suspicion patients with trivial lung findings, with other definite lesions of lues.⁽¹¹⁰⁾

Cases of ulcerating gummata have been reported by Beriel, in which there was fever, wasting sweats, foul abundant sputum with occasional pieces of tissue, and on physical examination a patch of dullness at the angle of the scapula with definite, limited rales. In these mercurial inunctions caused a prompt improvement.

In luetic phthisis the onset is insidious, and until markedly developed, differs but little from tuberculosis. Symptoms such as cough, tachycardia, gastric disorders, etc., which have been shown by Pottenger⁽¹⁸⁾ to be due to a reflex stimulation of the vagus, are not present in lues until the later stages, when the involvement of the bronchial glands becomes more marked and causes the stimulation. If coughing is found early in pulmonary lues it is due to laryngeal, tracheal or bronchial lesions.⁽¹¹¹⁾ Dyspnea is a very common symptom that may be severe, due to stenotic involvement of the trachea and bronchi. Hoarseness may be present from the involvement of the larynx. Hemoptysis is less common than in tuberculosis, probably due to the chronic obliterative endarteritis present. Lissner and Remsen⁽¹⁵⁾ have reported a fatal case. Night sweats and fever are sometimes present, although early in the course temperature is absent. Later a variable type of temperature may be present.⁽¹⁷⁾ It may be of a septic, intermittent or remittent type.⁽¹¹⁾ Emaciation is gradual, but not nearly so marked as in tuberculosis. The fibroid form may be latent until right heart failure supervenes, and clinically may not be distinguishable upon physical examination from that due to tuberculosis. Osler⁽⁵⁾ and Perry⁽¹⁵⁾ have each reported a case presenting that clinical picture.

DIAGNOSIS

The diagnosis of pulmonary syphilis is a diagnosis by elimination, as there is nothing absolutely characteristic in the clinical history or in the physical signs. They are the signs associated with infiltration and fibrosis of the lungs with or without bronchiectasis, as the case may be. Many cases of lung syphilis are pronounced hopeless tuberculosis, and as Virchow⁽¹²⁾ tersely stated "Some patients die of so-called tuberculosis for lack of anti-symphilitic treatment."

Tuberculosis and syphilis may co-exist. In differentiating between these two conditions it is well to remember, first that tuberculosis affects the apex and subsequently the apex of the lower lobe and progresses along a certain route, while syphilis is prone to involve the hilus and the base. Second, that tuberculosis tends to cavitation, syphilis to fibrosis, even the pulmonary gummata rarely break down. The cavities found in tuberculosis are due to destruction of lung tissue, but may also be due to bronchiectasis. Cavities found in pulmonary lues are usually bronchiectatic. Third, syphilis frequently causes stenosis of trachea or bronchi,

tuberculosis very rarely does. Fourth, tuberculosis lesions are common, syphilitic lung lesions rare, and lastly, syphilis is more frequently unilateral and circumscribed than tuberculosis.

I have not been able to find in the literature that spirochaetae have been demonstrated in the lung tissue. In D'Arcy Power's "System of Syphilis" a case is reported in which spirochaetae were found in the sputum, but, when one considers all the spirochaetae to be found in the mouth one realizes how extremely difficult it would be to differentiate it.

The x-ray is invaluable in the diagnosis of pulmonary syphilis, frequently revealing the flame-shaped shadow about the hilus with the fibrous strands running out along the septa. This picture, although not absolutely characteristic, is very different from that due to tuberculosis.

The physical signs, like the symptoms, are not characteristic, but depend upon the character and location of the lesion. Many things may help in more frequent discovery of this supposedly rather rare condition, and among these are the following: the presence of symptoms referable to the lungs, the



Figure I—Before treatment, April 28, 1913.

absence of tubercle bacilli upon repeated examination, the history of syphilitic infection, plus the presence of other manifestations of syphilis in other parts of the body, or the presence of a positive Wassermann reaction, and, as Lisser says, ⁽¹⁰⁾ "the lack of proportion between the gravity of the physical findings, the severity of the symptoms, and the astonishingly good appearance of the patient," and the bearing in mind what Virchow ⁽²⁾ has said, which we have already quoted.

PROGNOSIS

If the disease is not recognized in time the emaciation will become marked, lesions in other viscera will occur, and death may result from general weakness or from complications. It is surprising how much can be done, however, even in markedly enfeebled patients by prompt anti-syphilitic treatment.

Pulmonary lues lessens the resistance of a patient and renders him more liable to tuberculous infection. When tuberculosis is added to an active, virulent syphilis the tuberculosis pursues a very rapid course; but when tuberculosis develops in a patient with an old syphilitic infection, the case may be without

fever and tend toward the chronic fibroid type. ⁽¹⁶⁾

TREATMENT

The treatment of pulmonary syphilis is the treatment of syphilis of any part of the body. If pulmonary tuberculosis co-exists the use of potassium iodide should be guarded, for it is well known that potassium iodide causes a rapid breaking down of tuberculous lesions.

The subsidence of symptoms and the clearing up of physical signs does not mean the curing of syphilis. It is a well known fact that it is almost impossible to obtain a negative Wassermann reaction in pulmonary lues. It is inadvisable to consider any one free from syphilis until not only the blood Wassermann test, but the spinal fluid Wassermann reaction as well, is negative several years after the last anti-syphilitic treatment. ⁽¹⁴⁾

CASE REPORT

F. H. H. First seen April 29, 1918. Age, thirty-one years. Farmer. Married. Wife has borne no children, and has had no miscarriages. His personal history is negative with the exception of a sore on the penis, which disappeared without treatment. Family history negative.

He came complaining of a slightly productive cough, which began about three months before I saw him. This cough was accompanied by a slight pain in the right chest, although he stated he had had suggestions of this pain for the past three years. He gave a rather doubtful history of night sweats and slight loss in weight. A diagnosis of tuberculosis had been made.

Physical examination revealed a man six feet tall, weight one hundred and thirty-eight pounds. Head and neck negative. Heart, normal. Abdomen negative except for a small epigastric hernia. Reflexes normal. Urine, negative. The blood showed a normal white count. Normal picture on stain. Slight evidence of a secondary anemia in the red count. Stomach analysis normal. Von Pirquet test slightly positive.

During an observation of two weeks in the hospital his temperature never rose above one hundred and his sputum failed to reveal tubercle bacilli upon repeated examination. The blood Wassermann reaction was four plus.

Examination of the lungs showed a slight difference of expansion between the right and the left, the right seeming to lag toward its base. Palpation, negative. Percussion, questionable hyperresonance about the region of the right fourth to the sixth rib in front. Auscultation, breath sounds were slightly increased over this area. No rales were demonstrable. X-ray examination showed the typical flame shaped consolidation about the hilus and the fibrous septa running toward periphery of the lung.

On May 7, 1918, his weight was one hundred and thirty-six pounds, and at that time he was given nine-tenths of a gram novarsenobenzol and put on mercurial inunctions with large doses of potassium iodide.

On May 16, 1918, his weight was one hundred and forty-one pounds. He was given nine-tenths of a gram of novarsenobenzol.

On May 23rd he was given another injection and again on May 29th. After each injection his chest was examined by x-ray. Each time there was a definite lessening of the shadow found on the first examination.

He left the hospital for his home at this time and reported again on June 15th for an injection of nine-tenths of a gram of novarsenobenzol, and on July 7th for another injection of nine-tenths of a gram. His weight at this time was one hundred and forty-six, his Wassermann reaction still positive. He was not seen again until September 9, 1918, when he came in complaining of a slight cough and a trace of blood, which promptly stopped when he stopped taking the iodides. During

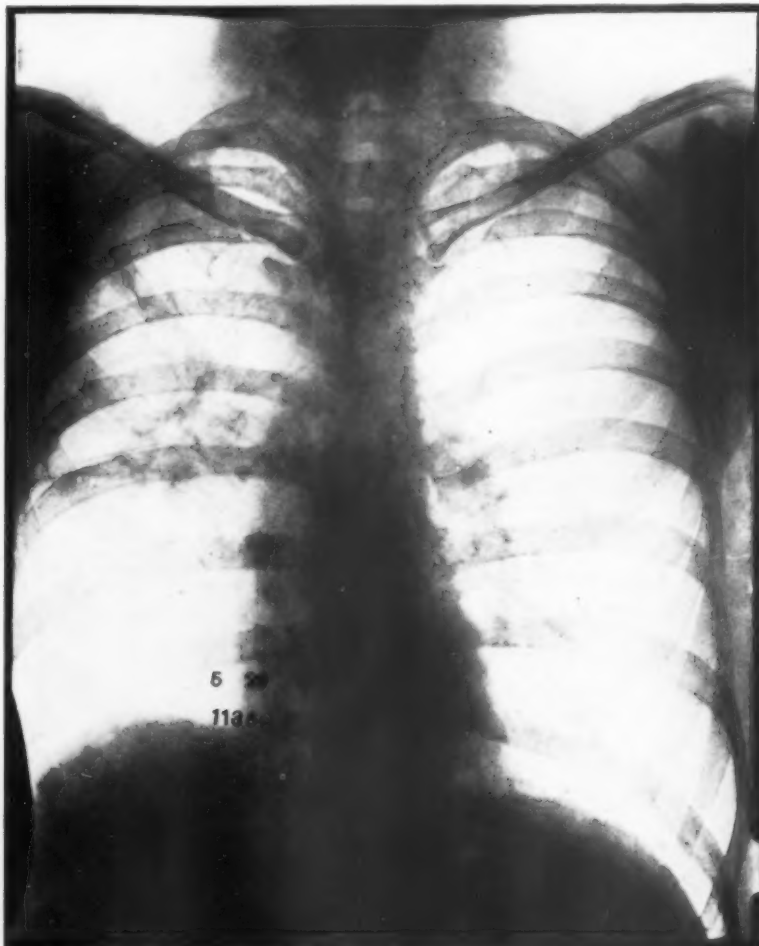


Figure II—After treatment, September 21, 1918.

the interval he had continued the mercurial inunctions and the iodides. September 9, 1918, his weight was one hundred and forty-five. He was given another injection of nine-tenths of a gram of novarsenobenzol.

He was not seen again until April 2, 1919, when he reported again, saying he was absolutely normal, and since he was last seen he had continued the mercurial inunctions faithfully six days on and six days off. His physical examination was negative. All symptoms had disappeared. His weight was one hundred and sixty pounds. The Wassermann reaction was still four plus. X-ray examination at this time showed still more marked improvement.

On May 8, 1919, his weight was one hundred and sixty-two pounds. He was again given nine-tenths of a gram novarsenobenzol, and on May 29th he was given another injection of nine-tenths of a gram. Physical findings and clinical symptoms had entirely disappeared, and as he said he saw no reason to continue treatment he disappeared from observation until March, 1920, when he told me in answer to my letter of inquiry that he was feeling absolutely well; his weight was one hundred and eighty pounds.

He was seen last on September 10, 1920. Weight one hundred and

seventy-five pounds. Wasserman test still three plus, although physical examination was entirely negative.

CONCLUSION

If we were to follow Fowler's postulates this case could not be considered as pulmonary lues, for no post mortem has been performed, nor were there other clinical manifestations of lues found, but Fowler advanced these postulates before the advent of the Wassermann test and the use of the x-ray.

The definite history of syphilitic infection and the repeatedly positive Wassermann reaction is enough to convince us that this man had lues. However, it is not unusual for lues and tuberculosis to co-exist in the same individual, but the gradual onset, the slow course, the physical findings at the base and hilus, with little fever, are not those of tuberculosis. This, combined with the repeated absence of tubercle bacilli, the positive Wassermann reaction and the typical x-ray findings, with definite change in the physical and x-ray findings under treatment, combined with the marked improvement in the general physical health (the weight increasing forty-four pounds), are sufficient to our mind to prove this case one of pulmonary lues.

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Hyperthyroidism, Basal Metabolism and Radiography*

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THE relation of a pathological condition, an exact laboratory method of estimating the severity of this pathological condition and the applicability of a remedy with which we, as specialists, are peculiarly interested, must bespeak our careful attention.

Hyperthyroidism is a condition that is much more common than is generally supposed. When we consider that appreciable enlargement of the neck is not necessary for hyperthyroidism to be present in even advanced degree we welcome any method of precision in establishing an exact diagnosis. I do not refer entirely to substernal thyroids, which if looked for are not difficult to detect, but to cases which are seen frequently with no appreciable enlargement either above or below the clavicle but giving a plus test for basal metabolism. Many patients of this kind wander from one medical man to another

with varied diagnoses, the principal ones being neurasthenia and disease of the heart muscle. A little care in the study of these cases will many times result in a score where before there has been repeated failure.

Of the conditions that must be considered in a study of the thyroid, but not applicable to this paper, we must think of adolescent goiter and malignant disease. We have remaining adenomata, colloid goiter and primary and secondary hyperthyroidism.

Too much attention has been given to so-called characteristic symptoms of hyperthyroidism: exophthalmos, goiter, tachycardia and tremor. Several of these signs may be absent and others only obscurely present, and still the person almost invalidated from the systemic effect of this disease. Note should be made of the lesser symptoms as their value has been under-estimated. Almost absence of winking, the usual staring of the eye, nervousness, unusual perspiration, mental irritability and a slight but gradual loss of weight are

early symptoms not to be overlooked. In such cases tests of basal metabolism are of the greatest value.

I have learned to consider the result of such test, properly safeguarded, to be as reliable as the better known ones of blood pressure or even the thermometer. This is true in a negative as well as in a positive way. Cases with apparently cardinal symptoms have shown a normal metabolism, while subsequent history has proven them to have malignant or some other non-thyroidal disease.

The effect of x-ray or radium upon all cell activity does not need to be proven here. In proper doses its inhibition is without exception. These doses vary with different kinds of tissue, but the rule holds true. Because one operator, giving an inappropriately small dose of x-ray, stimulates an epithelioma, while another destroys with a proper dosage, the rule of inhibition is not disproved. The same is true in thyroid cases; there is a proper dose and it must be given if one is to suc-

*—Read at the annual meeting of The Radiological Society of North America, Chicago, December 9, 1921.

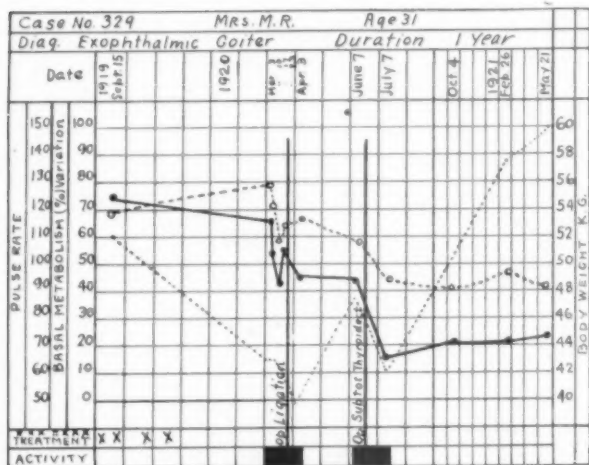


Figure I—Case No. 329. Exophthalmic goiter. Graphic chart showing change occurring in the basal metabolic rate and pulse. X-ray treatment indicated at the bottom by a cross.

ceed. Many combinations of the variable elements of technique of radium or x-ray treatments will succeed. As practical workers, we like to know just how the other man, who claims success, treats his cases, I will give my technique as one of the satisfactory combinations:

Three and one-half milliamperes, fifteen minutes, four and one-half mm. aluminum filter, eight and one-half inch spark gap, sixteen inch distance, six treatments on each side of neck (twelve treatments in all) given twice a week.

You will note this is the old fractional method. It has served me well for many years. I believe this method causes less disturbance during the period of treatment; the permanency of the effect is better and there is almost no danger of skin reactions. A few of my cases, during the last fifteen years have been re-treated. I do not look

upon this as a catastrophe. On the other hand, none of them have had myxedema. It might be well to add for comparison with surgical statistics that I have had no deaths. Nature is one of our best allies and the system adjusts itself to a certain degree of over or under stimulation, so it is found that we can be almost empirical in our dose, not varying it for the individual very much, but allowing this to be taken care of by the reciprocal action of the body.

I would not be understood to assert that all cases of hyperthyroidism yield to radiation, but the cases upon which favorable action is absent are few.

The main object of this paper is to bring out the relation between the three parts of my subject. Just how important is basal metabolism as a test for hyperthyroidism so that we may treat it intelligently with radiation? I be-

lieve fully one-sixth of the cases sent to me for this laboratory test are negative; clinically they are more than suspicious, too much so to neglect the test in justice to the patient. On the other hand, I believe that in another sixth of the cases seen the error has been made in the other way. A positive test is secured on patients who, naturally, have been sent by the last consultant for this condition, but previously have seen two or more of the profession who failed to become suspicious enough of the thyroid to have the test made or even treat them for the condition. So here is a plea for a careful basal metabolism test in all cases where a diagnosis of hyperthyroidism is made and also for this test in many cases of obscure nervous or supposed cardio-muscular disease. A word here can be interjected concerning the argued question of whether this test should be a laboratory pro-

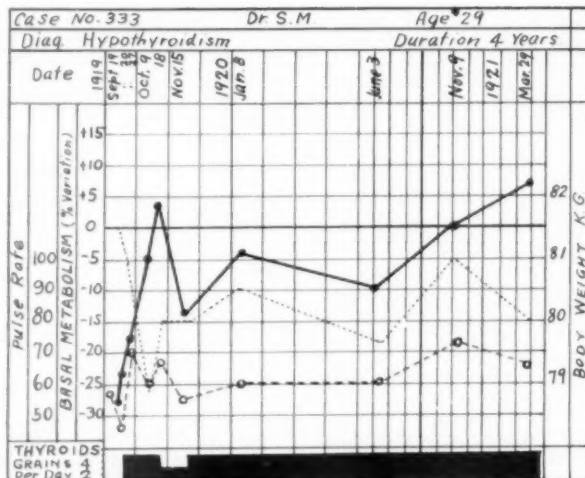


Figure II—Case No. 333. Exophthalmic goiter. Graphic chart showing change occurring in the basal metabolic rate and pulse. X-ray treatment indicated at the bottom by a cross.

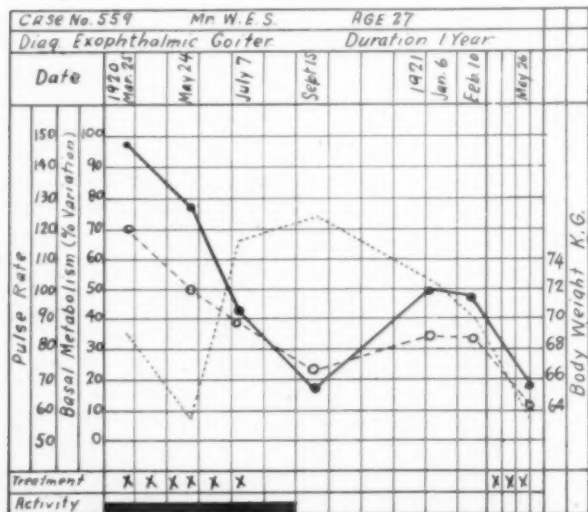


Figure III—Case No. 559. Exophthalmic goiter. Graphic chart showing change occurring in the basal metabolic rate and pulse. X-ray treatment indicated at the bottom by a cross.

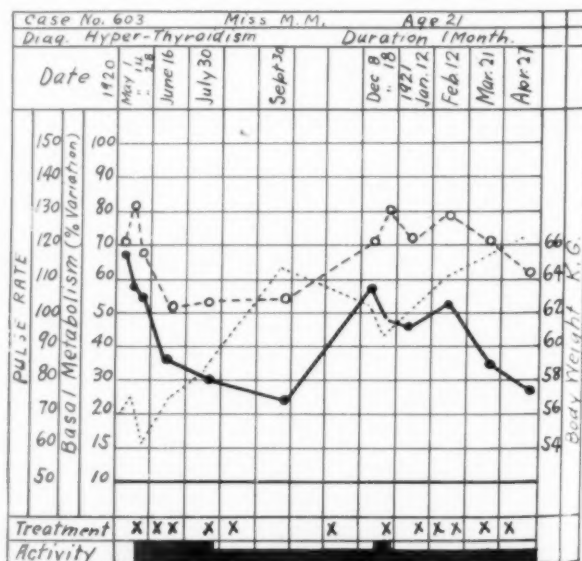


Figure IV—Case No. 603. Exophthalmic goiter. Graphic chart showing change occurring in the basal metabolic rate and pulse. X-ray treatment indicated at the bottom by a cross.

cedure, or is the necessity for absolute rest so great that it must be done at the bedside at home or in the hospital. My observation agrees with many others that an hour of rest, both mental and physical, is sufficient to insure accuracy, and that more extended quietude changes the result very little. Every effort should be made to have the patient look upon the procedure as simple and unimportant and not out of the ordinary. For this reason, I believe, when easy of accomplishment, tests taken at the home are better, and next to this the laboratory if it is well fitted up for the rest required by the patient. Going to a hospital over night, to many patients, is in and of itself a cause of undue mental disturbance and loss of sleep.

Now, the question comes, when shall the test be made again upon the patient undergoing radiation. While I know this is done by many at fairly frequent intervals, I have made a careful study and believe the pulse can be depended upon to tell the changes that are occurring in hyperthyroidism almost as accurately as the test of basal metabolism. The pulse should always be taken when the patient is in the same position and other facts should be the same. It is my custom to talk with the patient just before the treatment as they are on the treatment table, fingering the pulse during the entire conversation. In this way one can get the approximate rate practically without the patient's knowledge. I believe no metabolism tests, in the majority of cases, are necessary until

the final one, a month after the last treatment.

I have tried to show you the feelings of an independent worker as to the relation of the three parts of my subject, namely: A dependable treatment for a disease not easy to definitely diagnose, except for the newer laboratory method advocated.

In furtherance of the idea of the accuracy of the pulse as an indication of the effect of treatment, I will present to you, with the permission of Dr. James H. Means of Boston, the charts he showed at the A. M. A. meeting in June. These charts were not shown for the above purpose, but they illustrate it so well that by showing them instead of my own I am not left open to the criticism of bias.

Control of X-Ray Therapy in Hyperthyroidism by the Basal Metabolism Test*

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THE metabolism of the living organism may be defined as the sum total of the chemical changes going on in the cells of its body. These chemical changes involve the absorption of oxygen and the elimination of carbon dioxide and nitrogenous waste products. Heat and muscular effort are the energy manifestations of this chemical interchange, and the amount of work and heat so manifested is directly proportional to the rate at which this chemical interchange takes place.

Therefore, to measure the rate of metabolism, it is necessary to measure either the rate of heat production or the rate of the chemical interchange above mentioned. Although the heat and work resulting in a given period of time are capable of exact measurement (by direct calorimetry) it is clear that to measure the chemical interchange would be far more easily accomplished (indirect calorimetry).

In practice the nitrogenous excretions need not be considered, since their increase or decrease does not effect appreciably the other two factors, namely, the oxygen intake and the carbon dioxide output.

To simplify the process still further, it is also unnecessary to measure the carbon dioxide output, since the ratio between the heat and work, that is, the metabolism, and the carbon dioxide output is not appreciably altered by the increase or decrease in the carbon diox-

ide eliminated in conditions in which the test is of value.

There remains, then, only the task of measuring the oxygen intake, and nowadays, when we speak of measuring the rate of metabolism, we think of it in terms of measuring only the oxygen part of this chemical interchange. In other words, a measure of the rate of oxygen absorption is practically a measure of the rate of heat production, that is, metabolism.

It is for this reason that the old-time gas analysis method has not met with more favor, since even the greatest amount of error which can result from neglecting to take into account the carbon dioxide is only about two per cent, whereas the metabolism itself, in the same individual, varies an average of five per cent from one test to the next, even in the most rigidly controlled conditions. This small percentage of error, fortunately, is of no possible clinical significance.

This method of using the rate of oxygen absorption as an index to the rate of heat production involves a translation of these oxygen units into heat units, or calories. To do this, the heat value of oxygen is taken as 4.825 calories per liter, and by multiplying this factor by the number of liters of oxygen consumed in a given period of time, the number of heat units liberated during this period of time is thus made known. The final result, however, is stated in terms of a plus or minus per cent of the subject's so-called normal rate.

An apparatus (Fig. 1) for measuring this rate of oxygen intake, and also

the method of reading off directly this per cent rate of metabolism, devised purposely to avoid the old-time useless repetitions of these calculations, is described in detail elsewhere.⁽¹⁾

BASAL METABOLISM DEFINED

Muscular work claims a large share in the total metabolism, but since it varies so widely under different conditions, the disturbing influence of its variation must be reduced to a minimum. This is done by having the patient refrain from all muscular effort during the test.

Another variable and therefore disturbing factor which must also be reduced to a minimum is the influence upon the heat output of the body caused by the absorption of food from the alimentary canal. This influence is spoken of as the specific dynamic action of food. It varies with the kind and amount of food and the rate of its absorption. In practice, therefore, to eliminate the variable influences which muscular effort and the absorption of food have upon the rate of metabolism, the test is performed twelve to fourteen hours after the last meal, preferably in the morning before breakfast, and with the patient lying at complete muscular rest for twenty or thirty minutes before the test is made. Under these conditions the rate of heat production, or metabolism of the individual is thus reduced to the minimum necessary to maintain the temperature of the body.

This minimum of heat production is called the basal metabolism. It is a surprisingly constant quantity in individuals

*—Read at the annual meeting of The Radiological Society of North America, Chicago, December 9, 1921.

of the same age and sex, being higher in youth than in adults, and in males than in females. Indeed, the normal rate of metabolism varies less from one individual to another as compared with its variation seen in certain pathological conditions than does the body temperature of normal individuals as compared with the temperature variations observed in fevers.

A concise table has been compiled by Aub and Du Bois giving the various rates of metabolism for both sexes and ages from six to eighty years, so that these factors need only to be taken into account to determine what is normal in any given case. So true is this that when the basal metabolism of a given individual varies more than the arbitrarily chosen limit of ten per cent more or less than the normal for that patient's age, certain diseases may be diagnosed on the basis of this change from the normal rate.

CLINICAL INTERPRETATIONS

Reports of various investigators discussing the uses of the basal metabolism test in goiter conditions have had such prominent place in medical literature of the last two years that those not thoroughly familiar with the subject have come to believe that the rate of metabolism is influenced only in hypo and hyperthyroidism and in exophthalmic goiter. The question most commonly asked is: In what patients other than those suffering from thyroid conditions may the basal metabolism test be useful?

A. The metabolism rate is raised in—

1. Pernicious anemia (as high as plus forty per cent in some cases).
2. Leukemias.
3. Typhoid (mainly because of fever).
4. Pregnancy (about plus twenty per cent at term).
5. All fevers (from plus five to plus ten per cent rise in metabolism for each Fahrenheit degree rise in temperature).
6. Hyperthyroidism (from twenty to forty per cent in mild, forty to sixty per cent in moderate, sixty to one hundred per cent or more in severe cases).
7. Hyperpituitarism, that is, gigantism or achromegaly (up to plus forty per cent).
8. Diabetes (up to plus twenty per cent in early cases, although below normal after the patient becomes emaciated).
9. Cardiac decompensation (up to plus forty per cent).

B. The metabolism is reduced in—

1. Myxedema and cretinism, that is, hypo-thyroidism (as low as minus twenty-five per cent).

2. Froelich's syndrome of pituitary origin (about minus twenty-five per cent, although in Froelich's syndrome of the eunuchoid type, from which it is most often clinically indistinguishable, the rate is normal).

3. Pathological obesity of hypothyroid or pituitary origin. Although in simple obesity, (the obesity of laziness and big eaters) the rate is normal. In the former, glandular therapy is indicated, but in the latter, thyroid preparations should positively not be used, since thyroxin increases the combustion of muscle tissue instead of fat tissue.

4. Extreme cachexia, as in tuberculosis, diabetes, prolonged starvation, etc., (as low as minus thirty per cent).

5. Persons in perfectly normal health, but running low heart rates, say as low as fifty, may show a metabolism rate as low as minus twenty per cent.

6. Addison's disease (about minus thirty per cent).

Combinations of these conditions may give any kind of a rate, that is, an emaciated tuberculous patient with fever may be low on account of the emaciation or high on account of the fever, or normal on account of both variations counter balancing each other.

Since there are so many pathological conditions which raise or lower the rate of metabolism, the question, therefore, is: Why is the test used only in diagnosing thyroid and pituitary abnormalities? The answer is simply this: All of the above named pathological conditions, excepting those of pituitary and thyroid abnormalities, are diagnosed

far more readily by other more obvious means. Who needs a metabolism test to recognize pernicious anemia, or cardiac decompensation, or a full term pregnancy?

However, suppose a clinician in a suspected case of hyperthyroidism finds the metabolism increased, say, plus thirty per cent. If the patient has four or five degrees of fever at the time of the test, and the clinician does not know that the metabolism is markedly increased by fever he would be easily misled into error in his diagnosis of hyperthyroidism. Therefore, although we do not find a use for the test in diagnosing most of the conditions named above, it is absolutely necessary that we bear in mind that these conditions influence the metabolic rate.

On the other hand, we have no means of recognizing a beginning hyperthyroidism in the presence of symptoms suggesting incipient tuberculosis, or neurasthenia, or the neuroses of adolescence, excepting through the basal metabolism test. For example, the patient illustrated in Fig. 2 was diagnosed by his physician as a "Neuro". Hyperthyroidism was not suspected because of the absence of tumor and exophthalmus. The heart rate was variable, the tremor was attributed to other causes, the loss in weight, although amounting to some fifty or more pounds, had covered a period of two years and the complaint of weakness was considered a part of the general picture of neurasthenia. Having been misled by some recent work on the endocrines in which the statement was made that some forms of neurasthenia are due to hypothyroidism and others to hyperthyroidism, the physician requested a basal metabolism test in this case, in the belief that the patient would show a "hypothyroidism neurasthenia." The test, however, showed a fifty-four per cent increase in the metabolism and a subsequent removal of a substernal thyroid with ultimate return of a normal metabolic rate and complete disappearance of the symptoms confirmed the diagnosis of hyperthyroidism.

Likewise, the two types of Froelich's syndrome can often be distinguished only by means of a determination of the metabolic rate. The patient illustrated in Fig. 3 was exhibited by his physician as a typical case of dystrophia adiposa genitalis of hypopituitary origin. The basal metabolism was normal, however, and the fact that the patient showed tallness rather than dwarfness for his age, and because of the absence of brain tumor symptoms, a diagnosis of eunuchoidism was made.

Addison's disease has often been confused with myxedema, because of the pigmentation of the skin observed



Figure 1—Shows apparatus employed for making basal metabolism estimation as described by the author.

in some cases of the latter, when (if the low blood pressure symptom is doubtful, as from a complicating nephritis) the two can be differentiated only by the therapeutic test, that is, through thyroid therapy, controlled by successive metabolism determinations. The patient illustrated in Fig. 4 had been treated for months on various mixtures of thymus, pineal, and pancreas gland preparation for his ailment which had been diagnosed as Addison's disease because of the marked bronzing of the skin. The adynamia, loss of memory, falling of the hair, and the skin changes, however, suggested hypothyroidism. All of these symptoms disappeared in about three weeks on thyroid gland therapy, the metabolism test showing a rise of the metabolic rate from minus thirty-two per cent to normal.

Patients complaining of recent rapid gain in weight can not be effectually treated until the metabolism rate shows whether the condition is that of the simple or of the endocrine type of obesity. Having determined by the basal metabolism test whether the condition is one of simple or of pathologic obesity, the data obtained from this may then be used to estimate the caloric or dietetic control of the one, and the thyroxin or thyroid gland treatment of the other.

The test is of most value in the borderline cases of hyperthyroidism, and while one seldom requires the test for recognition of the more advanced cases, it is most often in the advanced cases that the test is required to show how the disease in each individual case responds to the treatment—x-ray, rest in bed, ligation, thyroidectomy—and also to indicate which form of treatment in

a given case is the better one to employ at the outset.

Perhaps nothing is more striking than the use of the test in determining whether or not the correct dosage of thyroxin or thyroid preparations is being used in the treatment of myxedema, since these preparations vary in strength from nothing to full potency, and since individuals vary in the amount of the drug they require to bring the metabolism up to the normal basal level. Read Plummer, *Jour. A. M. A.*, July 23rd, 1921.

Another question is often asked: Is it possible to decide by the aid of the basal metabolism test whether or not radical operations may be safely undertaken in moderately severe cases of hyperthyroidism?

Mayo (*Surg. Gyn. and Obstetrics*, March, 1921) believes that a patient showing a metabolism rate of plus forty per cent is a more dangerous risk surgically when the rate is on the upgrade, than the one whose rate is plus sixty per cent, with the rate on the downgrade, as shown by successive tests, taken a few weeks or days apart. Other factors, that is, the age, the state of nutrition, condition of the heart, etc., are obviously most important, also, in deciding the question of operation.

Surgeons generally object to x-ray treatment for two reasons: First, too much of the gland may be destroyed by the x-ray, thus leaving the patient a victim to hypothyroidism. Second, many patients show absolutely no response to such treatment and the time lost in such temporizing is usually at

the expense of the myocardium, which suffers most of all from the toxicosis.

The radiologist in reply objects to surgery on the same grounds, namely, that the surgeon often removes too much of the gland, leaving the patient a victim to myxedema; also, many patients show only slight improvement, and others who are apparently cured, have recurrences of the disease after surgical removal of portions of the gland.

The effect of treatment in such cases is not so obvious, except to those who have dealt with large numbers of cases and whose results are proven by means other than personal opinion as to the outcome, and wrong diagnosis at the outset. For example, many marvelous cures are claimed by surgeons who remove goiters that are nothing but simple non-toxic goiters to begin with; many internists cure their exophthalmic goiter patients with thyroidectin serum who are not goiter patients at all; and the dabbler in endocrinology boasts of cures made with mixtures of thymus, pancreas, pineal, ovarian, and heaven knows what else extracts, when as a matter of fact the patient's rest in bed is perhaps the only factor in the course of treatment which caused the improvement. Spontaneous cures are not uncommon, and many rush off proclaiming cures, when only a temporary improvement has been achieved.

And so, what with wrong diagnoses at the outset, and mistaken cures at the finish, the physician will have less success of this sort who puts aside personal opinion for definite evidence based on accurate metabolism control of his cases. As Du Bois says, the method of metabolic rate determination has become the therapeutic nihilist in the treatment of the goiter patient.



Figure II—Case illustrating the advantage of using basal metabolism estimation to distinguish between neuroasthenia and hyperthyroidism. Metabolic rate plus fifty-four per cent. Surgical removal of the sub-sternal thyroid gave relief.



Figure III—Patient illustrating the value of basal metabolism estimation to distinguish between dystrophia adiposa genitalis of hypopituitary origin and eunuchoidism.



Figure IV—Patient illustrating the value of basal metabolism estimation to distinguish between Addison's disease and hypothyroidism.

IS HYPER-SECRETION OF THE THYROID REDUCED BY X-RAY TREATMENT?

The multiplicity of opinions of former days for and against the use of the roentgen ray in the treatment of hyperthyroidism came about from, first, the irregularity of dosage and the variations in the technique of different operators, and second, the need of some method of determining whether or not the patient's supernormal rate of metabolism returned more nearly to the normal, coincident with the actual or imagined improvement in the clinical symptoms following such treatment.

That the secretion of the thyroid gland may be diminished by x-ray treatment is no longer questioned. Normal individuals in whom a diagnosis of hyperthyroidism has been erroneously made, have been rendered victims of hypothyroidism with single moderate doses, and even extremely toxic hyperthyroid individuals have developed hypothyroidism following repeated massive doses. The question of successful treatment, therefore, is one of correct dosage. It has been commonly observed that some patients become distinctly more toxic through repeated small doses, undoubtedly from the stimulating rather than destructive action of such treatment. On the other hand the single large dose is dangerous to the patient within the twenty-four hours following the exposure. The immediate effect of such large doses is seen in the markedly increased irritability, even to the point of temporary dementia, and an increase in the already too rapid heart rate, even to the point of cardiac failure.

No attempt will be made here to review the various reports which have accumulated in the last seven or eight years on this subject, some two hundred of which have been catalogued by Ludin.⁽²⁾

Seymour⁽³⁾ summarizes the advantages of the method of roentgen ray treatment of hyperthyroidism as follows:

1. There are no fatalities.
2. There is no resulting scar, as after operation.
3. It does not interfere with the patient's occupation.
4. It is painless and causes very little inconvenience to the patient.
5. If unsuccessful, an operation may be performed with less work because of the favorable action of the roentgen ray on the thymus gland.

Means and Aub⁽⁴⁾ believe that "the chance of cure in exophthalmic goiter is as good with the roentgen ray as with surgery, in groups of equal toxicity." They give preference to the roentgen ray method, since the danger

of a fatal outcome is less, and they believe that surgery should be employed only after the roentgen ray and other methods have failed.

It has been the privilege of the present writer to follow the effects of x-ray treatment in a number of patients under the care of Dr. Charles Spencer Williamson and of Dr. R. H. Babcock, both of Chicago, by determining from time to time whether or not such treatments resulted in a return of the basal metabolism to the normal. Both of these men are of the opinion that in selected cases the x-ray method of treatment is undoubtedly superior to surgical operation. Cases were encountered in which the rate of metabolism did not return entirely to the normal level, but these were, nevertheless, distinctly benefited, so that thyroidectomy could be undertaken later with less danger.

The objection to the use of the x-ray on the ground that it renders surgery more difficult because of the dense adhesions produced by the x-ray, is not a serious one, at least, when compared with the advantages to be gained. It is significant to note that many patients who come in for x-ray treatment have previously been operated upon.

The most valuable single contribution of recent date on the subject of x-ray treatment in hyperthyroidism is perhaps that of Means.⁽⁵⁾ The characteristic return of the basal metabolic rate more and more nearly to the normal, following each exposure to the x-rays, is graphically represented on charts for a number of the cases reported. The paper also discusses much of practical value pertaining to the general subject of basal metabolism and its clinical interpretations.

CONCLUSIONS

1. Hyperthyroidism is due to a hypersecretion of the thyroid gland. The more the secretion, the more pronounced the symptoms. The value of a given method of treatment, therefore, is proportional to its effect in suppressing this hypersecretion.

2. Also, the more the secretion, the higher the basal metabolism. The value of a given method of treatment in suppressing this hyper-secretion, relieving the symptoms, and reducing the basal metabolic rate, may, therefore, be shown by following its effect on the metabolic rate, since the symptoms themselves are more variable among different individuals than is the metabolic rate.

3. The favorable reports of some hundred or more investigators show that the roentgen rays have a curative effect in hyperthyroidism.

4. Its value depends, just as it does in the surgical treatment of the same condition, upon the technique, pre-

vious experience, and judgment of the operator.

5. The most important uses are (1) in the treatment of cases showing minor degrees of toxicity, and (2) in reducing the extreme toxicity in the more severe cases preliminary to surgical removal of the gland.

6. Even though not all patients respond to this method of treatment, which is likewise true when surgery is employed, the majority of them show distinct improvement clinically, the heart rate is diminished, the tumor is reduced, the nervous symptoms are improved, and the basal metabolism returns more nearly to the normal rate.

7. That a more perfect system of dosage has yet to be developed is obvious from the conflicting reports of various investigators regarding the value of the roentgen ray in treating the thyroid patient. Repeated small doses stimulate rather than destroy the toxin producing cells of the thyroid and therefore aggravate rather than improve the condition, as shown by symptoms of increased toxicity, and by a still further increase in the metabolic rate. The too massive dose is also to be avoided, because of its profound stimulation to the gland immediately following the exposure, with fatal consequence to the already overdriven heart.

8. Improper dosage, therefore, is to be avoided at both extremes, and this cannot be learned by the individual operator without the aid of some accurate measure of the results obtained in each individual case. The most accurate measure of these results yet discovered is the measure of the metabolic rate.

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DISCUSSION

DR. H. M. JONES (*University of Illinois*): Since the subject of basal metabolism is rather new to most of us, I will begin with a little bit of the elementary part of the subject if you will be patient until we get to the main gist of the argument.

Metabolism may be defined as the sum total of the chemical, physiological processes going on in the body and a measure of that metabolism or of those chemical changes is, or rather a measure of the oxygen consumption of the subject is, a very close measure of the rate of metabolism. It comes about in this way:

The heat eliminated from the human body per unit of square area of, say,

square meter or square foot, is uniform from one individual to another for a given age and sex. It varies with the age and sex, but given the age and sex of an individual, we know just as well what the number of units of heat radiated from that body is as surely as we know the body temperature of the normal person.

Inasmuch as we take the amount of heat eliminated by that body as an expression of the rate of metabolism and also inasmuch as the amount of oxygen consumed is proportional to the amount of heat given off, there is a direct relation between the amount of oxygen taken in and heat given off as there is between the amount of heat in a gram of coal and the amount of oxygen required to consume that gram of coal. It is chemical thermal relation. The measure of the oxygen is a measure of the heat. The measure of the heat is a measure of the rate of metabolism, basal metabolism.

Basal has a significance in this connection. It means that rate of metabolism at which the physiological process, including this consumption of oxygen, is at its lowest level for that individual—not at its lowest level, but at the lowest level for which it is feasible to measure. It is at its lowest measure when the subject is asleep, when he is under complete muscular relaxation, so we eliminate the amount of oxygen he consumes as that energy. When he is completely at mental and physical rest, when the gastro-intestinal tract is empty of digesting food so we get rid of the specific dynamic action of food, the metabolism is at its lowest ebb—that is basal metabolism. It is a uniform rate for the given individual and can be measured from hour to hour so that you can determine the rate of metabolism with reference to a normal scale.

This scale has been worked out by very accurate means and with very costly equipment by Lusk, Benedict, and men working with large, costly equipment, so that we know the number of heat units per calorie liberated by an individual for the body area of one square meter. In men between the ages of twenty and forty, according to one of the standard tables—there are two of them—the number is about thirty-nine or forty calories per hour per square meter.

Benedict has another way of stating rate, per twenty-four hours for the entire individual. There is a discussion as to which is the better method. There is no question but that DeBois' method in which we state calories per hour per square meter is the method that is almost entirely in use throughout the country for clinical work.

The conditions necessary for making a basal metabolism test, that is for determining the rate of oxygen consumption, are that the patient must be lying at complete rest, mentally and physically, and must have abstained from food for the last twelve hours. Those are basal metabolism conditions.

In what condition is the basal metabolism test of use? That is the question every doctor is asking. He wants to know what diseases or what pathological conditions bring about a change in this normal rate. To name those over would be to name some dozen conditions that cause a rise in the rate of metabolism. The commoner ones are any febrile condition, pregnancy, pernicious anemia, hyperthyroidism, hyperpituitarism and a number of others, all of which raise the rate.

On the other hand, there are some half dozen or so which cause a decrease in the rate and then after you explain this, the doctor wants to know why is it since these conditions effect the rate that this test is used practically only in the conditions where you have disturbances of the thyroid gland, either having too much secretion or too little, hyperthyroidism, hypothyroidism, hypopituitarism and hyperpituitarism. Why do we use these?

No one would think of making a test to determine a full term pregnancy or pernicious anemia or a fever. We have other more obvious and easy means of making a diagnosis of those conditions. It resolves itself to this condition, namely: hyperthyroidism, hypothyroidism and similar conditions of the pituitary body. The conditions are so obscure we have no other means of definitely locating or assigning the cause of the condition. Neurasthenia is one of the most common conditions confused with hyperthyroidism, tremor and usually a loss in weight. There are other symptoms that the patient may complain of, as you know, in neurasthenia.

Exophthalmos may be obscured by a family trait. A specific instance: I was called recently to make a test on a patient showing the signs of exophthalmos, tremor, tachycardia, vomiting, weakness and I don't recall the other symptom, and the picture was so clearly hyperthyroid that the doctors on the case were not interested in the diagnosis. They wanted to know "how extreme a hyperthyroid is this? In other words, are we safe in operating?"

The test is not only used to diagnose the conditions, but the severity of the conditions indicated by the degree to which the metabolism digresses from the normal. This patient's rate of metabolism turned out to be perfectly normal. That did not fit in with the clinical

findings. The patient's exophthalmos was traced to a definite family characteristic. Tremor was a nicotine tremor and vomiting was due to food poisoning of two or three days previous. That was definitely revealed in close questioning and every other feature that pertained to the hyperthyroidism not attributed to the neurotic condition explained on other grounds.

This patient, a woman forty years old, had a definite tumor which would direct attention at once to the thyroid. That was a goiter that had been there for twenty years. This diagnosis was cleared up by the little basal metabolism test.

Those conditions are being referred constantly to the physician who has means for making the basal metabolism test. I am safe in saying that the men who refer those conditions for basal metabolism test would not pass up the diagnosis if it were possible to make it, and I am safe, therefore, in saying that with careful technique in running the test, the test in these conditions where the rate is far away from the normal or where it is constantly normal, is the pathognomonic findings with the symptoms of hyperthyroidism. If you have a definite increase in basal metabolism, it is a hyperthyroidism without doubt.

Now, we are interested in the question of whether radiotherapy is effective in treatment of hyperthyroidism. There are not less than fifty men who have had experience proving that definitely to themselves, proving to their own satisfaction with reference to the clinical improvement of the condition, at least. I know of a half dozen men now in the audience who have followed the effects of the treatment by following from time to time the effect on the basal metabolism. Incidentally, as the patient's symptoms improve, as there is clinical improvement, there is tendency for the basal metabolism to return to normal until the normal health is restored and the normal weight observed. The question of whether radiotherapy is useful in the treatment of hyperthyroidism is settled in the minds of many men.

Most surgeons will recommend that there are various surgical measures. Dr. Venaval of the city here would recommend sub-total thyroidectomy any time. Others would not listen to it for taking out so much of a gland would leave the victim subject to hypothyroidism.

I attended a clinic in which seven patients were brought back, out of which only one of them was not in perfect health. He had a sub-total thyroidectomy, basal still fifty per cent above normal. His clinical symptoms

indicated that the condition was hardly improved. Six out of seven under that form of treatment were cured. In a series of cases for Dr. Charles Spencer Williams also of this city, there have been equally good results.

If you choose the cases, no selected cases, Dr. Williamson says that on cases not too far gone, cases under, you might say fifty per cent, and in fairly good physical condition, the x-ray will reduce the condition and the patient will return to normal state of health. Basal metabolism returns to normal within a period of six months to a year without an operation.

Atrill summarizes the advantages of using x-ray for this condition. He lists four advantages. One is that there are no fatalities.

That is the experience of practically every man who gives a large enough dose to be effective and that is the reason many men get no results with x-ray treatment—the doses are not large enough.

Is the case where too much of the gland is rayed or the dose is too strong, the patient will suffer for the next twenty-four hours with an extreme exacerbation of the conditions. Tachycardia is far more pronounced, the temperature goes up and tremor is much more noticeable. All other evidence is manifest. After that the rate gets progressively less and with each treatment after that the condition improves. There is definite improvement. I have seen that happen over the period of the last eighteen months in so many cases that I am positive when I say there is definite improvement with x-ray treatment when the dosage is heavy enough. There is no fatality when the dosage is not too great. No scars and no interference with the patient's occupation.

Many will not permit surgical operation. There is no pain. Those are the advantages.

This paper of Crile's was given in the A. M. A. Journal of October 22. I would rather refer you to one article, if you care to make reference to this article, if you want to know something about the subject of x-ray treatment in hyperthyroidism, I will give you this one reference. That is by Dr. Means in the A. M. A. Journal of July 30. I think there is summarized there in the most rational way the advantages of x-ray with his evidence there and incidentally many other valuable statements with reference to the use of basal metabolism in other conditions. That is the most rational resume of the use of basal metabolism in controlling thyroid treatment as well as the uses of basal metabolism that I know of in the literature of recent date.

There is this question to be settled. Whether it will ever be settled I cannot say. The trouble with giving the x-ray treatment is to know what dosage is required. One gives this amount and another another. One has one way of protecting the gland while raying one-half and the other rays the entire gland. There is no standard method of treatment. The x-ray man is justified in using his own judgment in that respect, as much as the surgeon is in determining how much of the gland he shall remove.

From the standpoint of the surgeon the x-ray method of treating hyperthyroidism is objectionable because he says you never know how much you are destroying of the gland. You leave the patient a victim of hyperthyroidism. Some patients do not react to the treatment. You leave them by such temporizing, subject to the injuries that result to the myocardium by permitting this intoxication to go on. The heart is the victim.

The internist says that the surgeon does not know how much of the gland he should take out, and is, therefore, just as liable to leave the patient a victim to hypothyroidism. These patients are as liable to return to subsequent operation as this hyperplastic tissue regenerates.

It is the experience of all of us to see these hyperthyroid patients returning after a sub-total thyroidectomy. The microscopic evidence of the effect of x-ray treatment is interesting. In fact it gives proof of one of the arguments against x-ray treatment. After x-ray treatment, the connective tissue of the gland is increased. That is shown by microscopic evidence. After the thyroid is rayed several times unsuccessfully, you have to resort to thyroidectomy and the gland is more difficult to remove. That is one of the objections. That is the only objection to x-ray treatment, and I am told by those who have removed thyroids after x-ray treatment that it is not a serious objection at that.

I believe we could summarize by saying that the outlook today as compared to a year ago is definitely in favor of using x-ray therapy in hyperthyroidism. This evidence has been made possible by not only the clinical observations of the patient's condition, but by observing that the rate of metabolism which is abnormal during the condition returns gradually to normal coincident with the improvement of the symptoms. (Applause).

DR. HAROLD SWANBERG (Quincy, Ill.): I believe that the basal metabolism test has been one of the greatest boons we have had to the x-ray treatment of hyperthyroidism or the radium treatment of hyperthyroidism. We have

been looking for something to prove our results in a scientific way and the metabolism test certainly is that. Many men have thought this test, referring back to the days when they studied physiology, a very cumbersome and extensive procedure and if those who have not looked into it yet will investigate they will be surprised to find how simple the test is. Any physician with a little application under the guidance of some one who has had some experience in this test, can make the test very well and very accurately. In fact, it is surprising how well these small apparatuses check up with the old typical meter chamber that was so complicated that it could only be manipulated by a metrician expert.

The test is important, not only in diagnosis, but in therapeutic control. The clinical symptoms of hyperthyroidism are such that not any of them are pathognomonic of the condition.

Dr. Van Allen has laid emphasis on the pulse rate. I have seen cases of hyperthyroidism with a slow pulse or a pulse normal or running in sixties. These cases are rare, but it must be remembered that the possibility of a substernal thyroid pressing upon the vagus nerve causing inhibition to the heart is a possible source of explanation of these cases. As I say, they are very rare, but still those are the cases we sometimes fall down upon.

I think that Dr. Warthin's remarks of yesterday should give us new enthusiasm. He has shown that with microscopic examination of the thyroid, if he takes the thyroid and examines it with the microscope, he can tell whether or not that gland has been subject to irradiation. The changes he showed yesterday showed there were mighty marked changes produced.

Dr. Means' work, I think, is very important. If you will notice on these slides, they correspond almost the same as a clinical chart would, that is in the study of pneumonia or typhoid fever. We are accustomed to observe three curves—pulse, respiration and temperature. In thyroid there are also three—pulse, rate and basal metabolism.

In Crile's article we should be very complimented to think that a surgeon of his type is willing to admit that x-ray treatment will reduce the basal metabolic rate quicker than ligation. He does not admit it with sub-total dissection of the thyroid, but he says that the results by x-ray treatment are quicker in pulling down the basal metabolism than ligation.

I think we owe him a debt of gratitude for the simple apparatus he has enabled us to use. Calculation is practically discarded. By the apparatus he

has invented any one can make a very simple and easy determination.

About the dosage, I feel heretofore we have been giving too light dosage. I have been giving larger dosage than I did early in the work. We do not need to give a dose corresponding to treatment of carcinoma, but we have to give a heavy dose in order to get a good erythema.

DR. PFAHLER: Mr. Chairman, Ladies and Gentlemen: I have been very much interested in this paper. I have treated approximately two hundred of these cases.

I have especially admired the work done in the Massachusetts General Hospital by the combination work, the keen work between the radiologists, the surgeon and the internist, all of whom review each of these cases before they are treated and they see them at intervals.

You have seen the beautiful records that are made, and like one of the previous speakers, I, too, was very much struck with the rather uniform parallelism of the pulse line and the basal metabolism line. Now I believe that this basal metabolism is very important and that wherever practical we should make use of it. I am glad to hear from Dr. Van Allen that this can be done with an hour's rest instead of twelve hours' rest or twenty-four hours' rest in a hospital. I have found that the great majority of the patients I have to deal with object to going to the hospital to have these tests made. I believe that until it is simplified so it can be done in some one's office—not in our own—that we can still go on and treat the great majority of these cases on the basis of the symptoms, a careful study of the symptoms which are known to all of you.

I attach a great deal of importance to the instability of the pulse, that is, the variability in the pulse upon slight exertion. For instance, if you are dealing with a bedfast patient and you count the pulse at rest and without any disturbance on the part of the patient and then set the patient up in bed you will find in this group of patients that the pulse rate will jump two, three or four times, as much as the pulse rate in a normal individual or an individual not suffering from hyperthyroidism.

In the office where the transient patients are I always make two pulse counts, one with the patient at rest—generally sitting or lying quietly on the table—and then with the patient taking a little exercise, such as walking across the room three times. You will find that the rise in pulse rate will be as before, two, three or four times the difference that you would get in another individual.

I think that instability or the variation in the pulse rate under those conditions is of great importance, not only in your diagnosis, but in estimating what you have accomplished by your treatment.

I have repeatedly had patients whose pulse at rest and sitting quietly would be perhaps eighty. When they walk across the floor three times, the pulse would be up to one hundred and twenty. That is too much difference. Your pulse and my pulse would probably vary ten beats under those circumstances. Here we have a variation of forty. When I get that condition, even though the pulse rate is forty, I know that I cannot stop treatment on that patient. Of course, we are ruling out organic heart disease or those conditions that would definitely give you pulse rise on slight exertion.

I believe, if you make this double check you can tell whether you are counting your pulse under excitement or not. For instance, I walk into the room in which the patient is sitting and take the pulse rate or some one else does it. My coming into the room may excite that patient and the pulse rate may be high. If you put that patient through a little exertion, I find it does not go up any higher. Therefore, I know that that pulse rate is already examined under excitement.

Then we let the patient have the treatment, perhaps after lying quietly on the treatment table for a time. We count the pulse rate again and find instead of going up it has dropped down to perhaps eighty, eighty-five or ninety. I do not try to treat these patients until the pulse rate returns to normal, say seventy-two in a sitting position. I think we should stop before it comes to normal because we get a delayed effect in these cases. If we watch that carefully, increase the interval between our final or late treatments, we will avoid any hypothyroidism.

The surgeons' argument that we may produce hypothyroidism is one of the best arguments we have. If we can produce hypothyroidism, we can cure the patients. He must admit it. We are reducing the secretion as he is by cutting out certain parts of the gland. We have from six to twelve guesses to make where he has one. Certainly our average ought to be better than his. (Applause).

DR. LEE C. GRABER (Cleveland, Ohio): There seems to be a very widespread notion that the estimation of basal metabolism by any one other than an expert is a very difficult thing to do. This is a misapprehension, partly justified by the fact that for many years or for a long time, the estimation of basal metabolism could only be done

by extensive, complicated apparatus, likely to become out of order and it had to be done in well equipped laboratories presided over by expert technicians.

Just last June I had the good fortune of doing post graduate work in Doctor Gabbard's clinic at Boston. I heard Doctor Means. I went over to the laboratory and found the apparatus out of order. The technician was very much fussed up and all in all the situation was one that would lead one to believe that it was impractical and could not be done by other than an expert. That was true last June, but we are in a world that is moving pretty fast, and it is not true now.

There is an apparatus now you can use nicely in your own office. The procedure is simple and can be done with any one with average training.

Somebody asked for the name of the instrument.

—If I will not be accused of boosting somebody's financial game I will give the name. It is the Sandborn Handy Apparatus and is on exhibition in the hallway. I use it and I find it exceedingly satisfactory. I have my patients come to the office by appointment in the morning. I tell the patients not to eat anything after seven o'clock in the evening and not to drink anything after four o'clock in the morning and come to my office for an early eight o'clock appointment.

The patient comes and I have him lie on the couch in the office quietly for half an hour, during which time I can do other work, attend to mail and things of that sort. Then the estimation is made and the patient goes home. That is all there is to it. It is a simple thing to do and is very satisfactory. That is the main reason for my speaking now.

DR. DARLING (New York): The treatment of hyperthyroidism, it seems to me, has about reached the stage where it will come into the hands of the roentgenologist or the radiologist. The points that I wish to inquire about rather than to try to tell about—because I have had a rather limited experience, but I expect to have a greater experience—are these: The possibility of hypothyroidism is not to be forgotten and no one wishes to condemn a patient to the possibility of a thyroid tablet every so often for the balance of his life.

It seems to me that we have a chance to nicely balance our therapy. For instance, we know that we can destroy and stimulate these secreting glands. If we can do that, we must be careful not to stimulate when we should destroy.

If we can destroy, we should be very careful to destroy the amount that the patient could stand at each seance, so I am going to advance this query—perhaps it has been done before: Suppose we divide the thyroid into four quarters. I believe it is possible to do this roughly, of course. We will save one quarter and keep one quarter sacred until the last moment, in the case of a sheet anchor to save us from hypothyroidism. Then we will take the other quarters and give the destructive dose to each one of these and follow the matter closely with our basal metabolism or the close rate as is indicated in the particular instance, and that way nicely control our treatment and follow along and in the end we will be conservative. You will not bring about a precipitant cure, of course, but you may be doing the patient a greater benefit.

DR. LAWRENCE: I simply want to add a voice of some experience in this matter. I have treated a great many cases of hyperthyroidism over the last ten years. It is work I have always enjoyed because of the fact that we get such definite results.

I think there is not quite a unanimity of opinion among the x-ray men even, therefore, I think the experience of all of us has some value.

In speaking of the instability of the pulse, I have had one patient, certainly, and possibly two others, that have had this type of variation in pulse. The pulse would run along one hundred and twenty standing or sitting, possibly a little less. The moment the patient lies down it drops to below normal, as low as from forty to seventy, repeatedly. On one patient I tested that out repeatedly and it was below normal and would remain that way a little while and then pick up to the normal rate. I would like to ask if any one else has noticed that variation of pulse rate? When I was using good sized doses I noticed this.

Two years ago somebody advocated milder doses. I tried it out and did not get results. I think that since the dose to be used has to be large, we should use adequate filtration and remember that we are after results. Somebody said we could get results with no scar. We may with large doses that continually have to be repeated. We may get the characteristic x-ray skin if we are not careful not to get them too large. That is where it is noticeable, around the throat, and we must be careful on that point.

DR. SANDERSON (*Iron Mountain*): So much has been said about Dr. Crile. It surprises me he has changed his views on the value of x-ray. I doubt

it. I know that Dr. Crile a year ago doubted the value of basal metabolism. The tests he uses have not been referred to—the so-called Goetsch, which consists of injecting six drops of adrenalin subcutaneously, injecting it into the deltoid muscle, taking the pulse two minutes after the injection with the patient lying down and taking the blood pressure at the same time, before and after injection. In five minutes time the pulse and blood pressure should return practically back to the normal. If there is a variation of ten or more degrees, you have a condition of hyperthyroidism. It is the test I followed in all of my cases.

The other pulse relation is something we followed in the army called the efferent syndrome, and was the cause of shell shock over in France, which is nothing more than a nervous phenomenon.

DR. JONES: I am glad to have this opportunity to quote my authority for the statement that I made. If I conveyed the impression that I understood that Crile had preferred x-ray treatment to surgery I certainly said something I did not mean to say in the first place. If I said that I misquoted my own idea of it.

I have here *The Journal of Radiology*, the December number. I will read you what Dr. Crile says. This is an abstract from an article by Dr. Crile, *A. M. A. Journal*, October 22. I did not read the original article. I do not know how I overlooked it because I am interested in that subject. I always scan through the front page of the *A. M. A.* to find what is there on anything in connection with that work. This article is quoted as being in the *A. M. A. Journal*.

Dr. Jones read the quotation referred to.

I know Dr. Crile's objection to the basal metabolism test. If he still uses the Goetsch test (if I am permitted to start that again)—the Goetsch test was shown by three men, I cannot give you the names, but in the *Journal of American Medical Science* of last February, or January, they tried out the value of the Goetsch test. They found it to be a test valuable in detecting numerous sorts of vasomotor instability—not specific to hyperthyroidism by a long ways.

Some one asked me to speak a little more in detail with reference to hyperpituitarism. It produces a condition called gigantism, which is familiar to all of you. Coming on in the adolescent period. I meant to say acromegaly, coming in the adolescent stage produces gigantism.

Cushing has done most of the work in surgery of the pituitary. I cannot give any of his statistics. His surgical technique, as you know, must be something very refined. I do not know of any one else but Cushing doing that work. He does get results in surgery of the pituitary body. In hyperpituitary there is a condition called eunuchoidism, a condition described by some German writers in which there is an inherent arrest of the sexual apparatus, seen practically only in males, I believe. A boy of the age of eight or ten will show this condition called dystrophia genitalis or Froehlich's syndrome. There is a distinction to be made between the two types of Froehlich's syndrome that due to hyperpituitarism and to the so-called eunuchoidism.

Removing the testicles will, in a boy of five, cause conditions you see in a boy eight or ten. You see a failure of the genitals to develop. A positive fat over the region of the genitals, buttocks covered with fat and rounded appearance of the face, more of the effeminate development.

In both conditions the basal metabolism in the hyperpituitary form of this condition is subnormal. The basal metabolism in the eunuchoid form is as normal as in any boy of the same age. The basal metabolism serves to distinguish between the two. There are other less definite methods of differentiation. In the hyperpituitary condition the patient is under size and in the eunuchoid form the patient is taller than normal.

Dr. Van Allen said this test was easy. The test for basal metabolism is not difficult. It is a plodding test, to a certainty. It must take your entire attention for the time while it is being done. It is not difficult, the apparatus is not expensive, and it is a thing that many of us would like to take up. I do not suppose that we will all do this work. This is the reason that I brought out the fact that the pulse could be a guide in many, many cases; perhaps not in all, so if you are sending your case to the laboratory for a test you do not have to send them except to get your diagnosis in the first place, afterwards to see if you are really successful.

Dr. Swanberg spoke about an erythema. I do not believe an erythema is to be looked upon as a good thing to have in these cases. I believe you get an atelectasis after several years if you have an erythema. I do not believe an erythema is to be looked upon as a good thing. My cases get a sort of brown, not an erythema. That is the reason for the fractional dose that I recommend.

X-Ray Studies of Mediastinal Shadows with Special Reference to Dermoid Cyst*

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OF the many conditions found roentgenologically in the mediastinum, neoplasm, either primary or metastatic, is not frequent. Aneurysm of the arch of the aorta is quite common and may be mistaken for a neoplasm. Other shadows may be due to Hodgkin's disease, enlarged thymus, substernal thyroid, abscesses, echinococcus cyst and dermoid cyst. Fibromata, chondromata and lipomata (benign neoplasms) have rarely been found, and although they may occur, they have not been demonstrated roentgenologically so far as I am aware.

Of the malignant neoplasms, sarcoma is more common than carcinoma. Sarcoma is usually primary in the form of lymphosarcoma. Lymphosarcoma, however may be secondary. Sarcomatous shadows vary in size and contour and those due to metastases often appear rounded and circumscribed. These may be small or very large, and usually multiple. Lymphosarcoma usually manifests itself as a large single shadow and may occupy the greater part of the chest. Metastasis frequently follows malignant sarcoma of bone and may also follow sarcoma of the tonsils, cervical lymph nodes, the breast, or other regions of the body.

Primary carcinoma of the mediastinum arises from the mucous membrane of either the esophagus or trachea and rarely from the remains of the thymus

gland. It may occupy either the right or left side of the mediastinum or may occupy both sides.

It is not, as a rule, confined to the mediastinum alone and not infrequently involves the lung and pleura as well. Carcinoma of the breast not infrequently metastasizes to the mediastinum although metastases may also be due to carcinoma elsewhere in the body. It is difficult to absolutely differentiate roentgenologically between primary and metastatic carcinoma; however, the clinical history may help to decide. The shadows in primary carcinoma are usually irregular in outline and often invade the lung and pleura. Shadows due to metastatic carcinoma are usually more regular in outline and are apt to be limited more to the region of the mediastinum, although invasion of the lungs is not infrequent. In neither the primary nor the metastatic carcinoma have we seen calcified shadows.

Aneurysm of the arch of the aorta may be mistaken for neoplasm. It may be differentiated from neoplasm more quickly and probably better by the roentgenoscope than by any other method, through observation of the expansile pulsation. One must be careful, however, and not mistake a normal pulsation, transmitted to an adjacent neoplasm, for an aneurysm. Roentgenographically the periphery of an aneurysm has a somewhat wavy appearance, as its borders are not sharply defined, due to pulsation. In neoplasm simulating aneurysm the periphery is usually well defined.

Hodgkin's disease, roentgenologically, resembles somewhat lymphosarcoma; indeed, the mediastinal shadows of these two diseases cannot be absolutely differentiated. In the former the shadows probably are not as large as in the latter. Hodgkin's disease as a rule makes its first appearance in the neck and later involves other regions. The mediastinal involvement is usually a later manifestation of this disease.

Enlarged thymus is occasionally manifested by a shadow occupying the anterior mediastinum. A history of difficult breathing, substernal dullness with pressure symptoms, especially in infants or young children, should arouse suspicion of enlarged thymus.

Abscess in the region of the mediastinum not infrequently is due to an extension of an inflammatory process from the lung and pleura. It may also follow infectious processes of the ribs, sternum or cellular tissue of the neck. Occasionally an amebic abscess involving the lung extends to the mediastinum. Roentgenologically a mediastinal abscess usually has a sharply defined border. It may be fairly large. No pulsation is visible roentgenologically. The shadows are not quite as dense as those due to neoplasm.

Echinococcus cyst, which is very rare, occasionally involves the mediastinum. Its common site is the right side in the region of the base. It may be attached to the diaphragm and not in-



Figure I.—Large tumor shadow occupying the right and left mediastinum and half of right and left upper lobes, due to metastatic lymphosarcoma. Patient had lymphosarcoma of the tonsil five months previous which was operated and removed.



Figure II.—Marked infiltration of both apices and upper lobes, in all probability metastatic lymphosarcoma. The infiltration appears well organized and regular. Patient has lymphosarcoma arising from the wall of the pharynx.

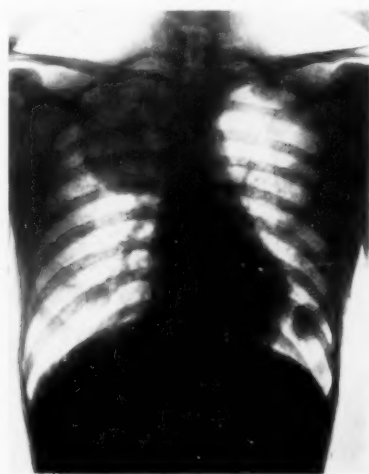


Figure III.—Large rounded circumscribed tumor shadow occupying right apex and upper lobe. There are also smaller rounded circumscribed shadows in the right and left lower lobes. Patient had amputation of the femur three years previous for periosteal sarcoma. The circumscribed rounded tumor shadows are quite characteristic of metastatic sarcoma.

*Read at mid-year meeting of the Radiological Society of North America, Boston, June 3 and 4, 1921.

frequently is an extension upward from the liver.

Dermoid cysts arise in the mediastinum and vary in size from that of a walnut to that of a child's head. The small tumors remain in the mediastinum while the large ones may extend outward into the pleural cavity. A few have been described occupying the right base. In shape they are usually spherical, but may be flattened when in contact with the diaphragm. The cyst wall may be very thin or quite thick, and is invariably adherent to surrounding structures, most commonly to the pleura. Partial calcification of the cyst wall has occurred in a number of cases. Cholesterol crystals are a common finding, and in the majority of cases the cyst also contains hair, epidermis, cartilage, bone, teeth, etc.

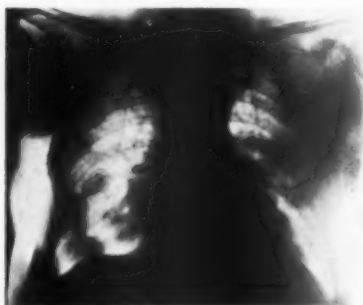


Figure IV.—Metastatic sarcoma of mediastinum and lungs twenty months after operation for sarcoma of the breast. The shadows are well defined spherical and dense, quite characteristic of metastatic sarcoma.

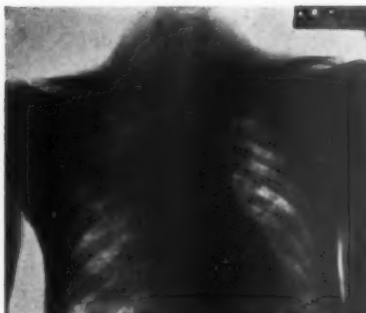


Figure V.—Primary carcinoma of the lung. The infiltration involves the right hilum and upper lobe.

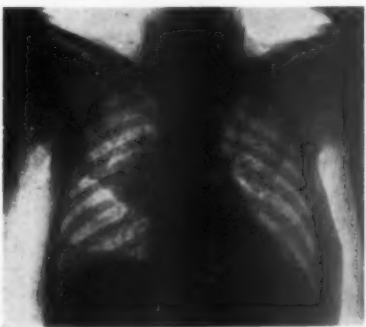


Figure VI.—Metastatic carcinoma right mediastinum and lung eighteen months after operation for breast carcinoma.

Heuer of Johns Hopkins, who reviewed the literature of dermoid cyst of the mediastinum, stated that Roger Morris collected a series of fifty-seven cases in 1905; Dangschat collected a series of forty-four cases in 1903; and Pohl collected a series of fifty-two cases in 1914. Very recently Hertzler reported a case of dermoid cyst of the mediastinum in his *Clinical Surgery*.

Our case is one of a white female, age 14 years. Admitted to Saint Agnes' Hospital December 12, 1920.

Family History—Unimportant. Parents living and well. Uncle on father's side died of cancer, otherwise negative.

Past History—Had measles, whooping cough and scarlet fever. Subject to frequent colds. Tonsillitis several times. Otherwise negative.

Present Illness—About four weeks ago, without any history of trauma, patient noticed a dull aching pain at upper end of sternum. At about the same time she noticed a slight bulging over this area. Since that time the right chest has bulged and tumor has grown to the size of a peach. Pain has disappeared entirely. No other symptoms noticed except a lump. About a week ago patient developed a cough with coryza and general malaise. This has grown worse in the last few days. Dr. Bloodgood has had patient under observation for the past two weeks. He referred her to Dr. Kelly for radium treatment and patient has received seven treatments. Mother thinks the tumor has grown smaller and softer since treatments.

Physical Examination—Patient is a well nourished child of about fourteen years, complaining of a slight cough. Perfectly oriented in all spheres. No dyspnea, edema, jaundice. Skin is darkly pigmented, otherwise clear. Veins of left side of face and neck most prominent. The head is negative. The mouth and naso-pharynx are negative excepting that the tonsils are greatly enlarged and almost meet.

Thorax—Asymmetrical, the right chest apparently bulging slightly. In midline is seen a semispherical tumor about the size of a peach at the upper end of the sternum. This is soft and attached to the bone with a definite edge. The heart sounds are normal. On percussion there is a flatness from about the third rib on the right side out almost to axillary line. This cannot be separated from the liver dullness. Percussion on the left is normal except that the retromanubrial dullness is greatly increased. Many mucous rales can be heard at the right apex and hilum, and at times a definite friction fremitus is heard to the right of the upper portion of the sternum.

Abdomen—Liver two fingers below costal margin, otherwise negative.

Extremities—Negative.

Blood—3,660,000 red blood corpuscles, 6,600 white blood corpuscles, hemoglobin, 68 per cent.

Urine—Negative except for a slight trace of albumin.

Roentgenoscopically there is a large rounded tumor shadow occupying the greater part of the lower two thirds of the right side of the chest. On deep inspiration this shadow moves freely and reveals lung structure posteriorly and below. The liver shadow appears somewhat depressed. It apparently is slightly attached to the diaphragm near the median line. No pulsation can be seen in this region. The upper right lobe and apex appear clear. The left lung is clear. The heart shadow is



Figure VII.—Extensive infiltration of both lungs due to metastatic carcinoma. Patient has carcinoma of the sigmoid and rectum.

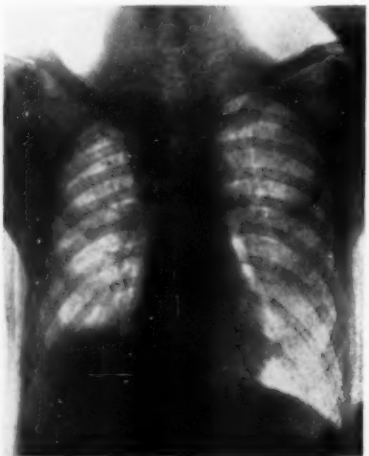


Figure VIII.—Dense fibrous infiltration of right apex and upper lobe extending downward toward the hilum. Infiltration simulates neoplasm, but is in all probability healed fibrous tuberculosis. Patient gives a definite history of tuberculosis.

displaced well to the left, probably the result of pressure by this tumor. The heart appears slightly enlarged. There is marked gradual curving of the dorsal spine backward. Stereoscopic roentgenograms and lateral roentgenograms of the chest confirm the above findings.

Impression—From the history and the above findings this tumor shadow is probably due to a large dermoid cyst. However, an echinococcus cyst is to be considered.

Operation—December 23, 1920, by Dr. Bloodgood. His notes of the operative findings are as follows: Novocaine. Incision made over swelling over sternum. This proved to be a cavity filled with thick yellow pus and granular debris, but on opening, adhesions of this cavity to chest could not be found. Incision then made below breast, nipple line, and rib removed. We then encountered, after dividing parietal pleura, a cyst. On opening it was found to be four mm. thick and to contain same material as cavity over the sternum, also hair. This made the diagnosis a dermoid cyst. Cover slips from piece showed no bacteria, no leukocytes.

Frozen section (of wall) showed fibrous tissue, no evidence of tuberculosis. Epithelial lining not seen.

The cyst rested upon the diaphragm below, to which it was slightly adherent, but from which it could be easily separated. To the outer side and above was the lung, with very few adhesions. This portion of the cyst could be separated, but the larger portion under the mediastinum could not be separated from the pericardium and further attempt at enucleation produced falling of blood pressure and rapid pulse. When this manipulation ceased, blood pressure rose and pulse improved. A

Brewer tube was sutured into the cyst and three pieces of long gauze, wet in salt, were packed in between the cyst and surrounding tissue.

Post Operative Course—Immediately after operation there was increased rate of respiration. Patient had very acute thirst and drank about two or more liters of water each twenty-four hours. The urine output ranged from three hundred to six hundred cc. in twenty-four hours. Before operation the urine was negative for casts with only a slight trace of albumin. It now showed plus one albumin and many casts. The temperature ranged between one hundred and three and one hundred and four.

For three days after the operation the pulse ranged between one hundred and forty and one hundred and sixty. The respiration averaged about fifty. There was rather free drainage around the tube. The amount of drainage through the tube was considerably less, being about two hundred cc. a day.



Figure X.—Large mediastinal tumor occupying greater part of right side of chest. Stereoscopically the tumor appeared more or less rounded in contour. Found five years after empyema. Exact nature of tumor not determined.

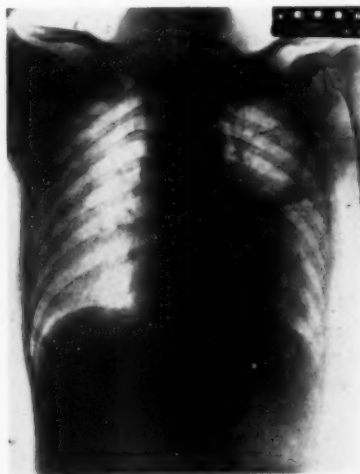


Figure XI.—Localized and well defined shadow in the region of the left hilum, mediastinum and part of the lower lobe, following pneumonia. In all probability walled off abscess.

Examination of lungs showed pneumonia of right lung.

The night of the second day after operation, because of the decreased output of urine, patient was given magnesium sulphate and the bowels moved seven times during the night. The next morning the patient appeared very much better. The respiration had decreased to forty, and the pulse to one hundred and forty and the temperature to one hundred and three. The pneumonia of the right lobe seemed to be clearing up. There was very little cyanosis. During the afternoon patient's pulse, respiration and temperature rose suddenly, the respirations reaching sixty and the pulse one hundred and eighty and very weak. The patient became very cyanotic and died in about an hour after the sudden change was noticed.

Necropsy by Dr. W. C. Caldwell—His notes are as follows: The Brewer tube and the drains were removed. On introducing the hand into the cavity through the incision, it was found that the large cyst had occupied practically the entire space of the right lung, the right lung being pushed up into a small space in the region of the clavicle and apex. The cyst extended from the mediastinum to the liver, to the chest wall, and almost to the clavicle. There was a definite pneumothorax as the cyst had decreased somewhat in size, since drainage. On attempting to detach the cyst, it was found to be very adherent above, in the region of the clavicle, but particularly in the mediastinum, where it was so firmly attached that one was unable to separate it with the gloved hand. On opening the cyst it was found to contain a tumor mass about the size of an orange attached at the upper portion of the cyst. This tumor mass was removed. It was impossible to remove the cyst wall intact,



Figure IX.—Large fusiform aneurysm. Marked expansile pulsation noted roentgenoscopically.



Figure XII.—Three weeks later, spontaneous rupture into bronchus with disappearance of shadow.

but a portion of the cyst wall was removed for examination. Examination of the small compressed lung showed what was apparently red hepatization. A block of this was removed for examination. There was now a cavity in the position formerly occupied by the right lung as large as a child's head.

Gross Pathology—The tumor mass which was irregular in outline, was soft and spongy in consistency, had a pinkish white appearance and looked very much like skin. It was covered with short fine hair. On section, the skin surface had a thin layer of connective tissue beneath, very similar to normal skin. Deeper down there was considerable fat and a connective tissue stroma. Piece of the cyst wall showed a very dense hard fibrous tissue almost like cartilage. Piece of lung showed consolidation.



Figure XIII.—Dermoid cyst occupying greater part of the right side of the chest. This tumor is somewhat spherical and there is no expansile pulsation roentgenoscopically. The possibility of echinococcus cyst was considered because of its site. Cyst markedly adherent to the mediastinum and sternum so that it could not be completely removed.



Figure XIV.—Gross specimen of dermoid cyst, showing its skin-like covering and numerous hairs.

Microscopic Study—Section of the cyst wall was very similar to that described immediately after the operation. It was composed of very dense fibrous tissue and there was no evidence of an epithelial lining. No hair follicles, no sebaceous glands, no sweat glands.

Section of the tumor showed an epithelial covering very much like skin. There were hair follicles, sebaceous glands, and sweat glands. Beneath the epithelium there was subcutaneous connective tissue and fat.

Section of the lung showed a chronic fibrosis with later chronic inflammatory tissue and fresh pneumonia in the stage of red hepatization.

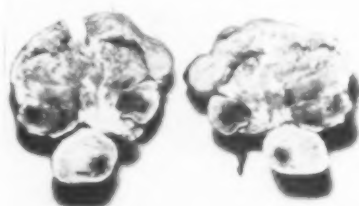


Figure XV.—Section through cyst.

From gross and microscopic findings it seems that the dermoid tumor with a pus material was inclosed in a fine fibrous cyst which probably represents a reaction of the body in walling off the original dermoid tumor.

Final Diagnosis—Huge dermoid cyst of right lung, firmly attached to the mediastinum.

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DISCUSSION

DR. J. C. BLOODGOOD, *Baltimore*:

I do not know what I can add in the discussion, but all of us must realize that due to the x-ray we have revealed the fact that the mediastinum is much more commonly involved than we have ever thought, even in primary lesions and in secondary lesions.

One of the most interesting observations I can speak of, which has not been mentioned, is the therapeutic dose of radium. If you have a mediastinal shadow, irrespective of the history, give intense radiation and there will be, in the great majority of cases, a reduction in the shadow. That means sarcoma. I have never seen after radiation a mediastinal tumor that I felt was carci-

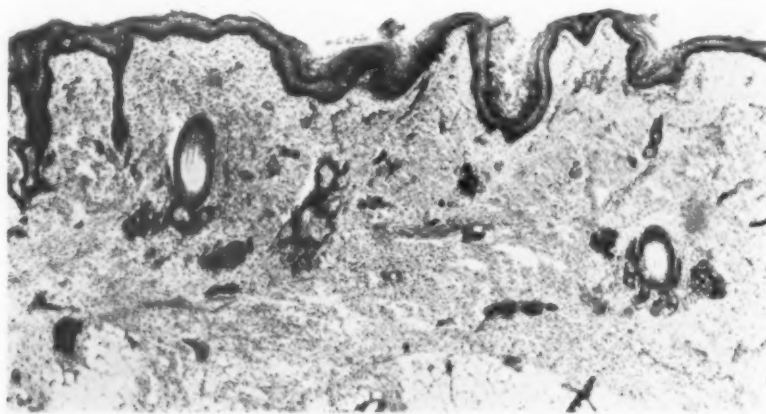


Figure XVI.—Photomicrograph of section of tumor reveals a definite layer of skin with hair follicles, sebaceous glands and sweat glands. Beneath the epithelium there is subcutaneous connective tissue and fat.

noma primary or secondary which showed any change whatever. In the little girl reported by Dr. Kahn, in which the huge size of the mediastinal tumor suggested a dermoid cyst there was no improvement whatever after radium. I felt it was unquestionably a carcinoma.

I do not for a moment feel that any of the sarcomata have been permanently cured by radium, but in all those we have been able to follow the sarcoma has grown very much smaller under radium. Of course, we can check a great number. There are primary tonsils and we take out the tonsils, or there are primary glands and we take out the glands and they show sarcoma cells. X-ray of the mediastinum is becoming a very important part of complete diagnosis. Unfortunately, we have not many autopsies.

The thing I am most interested in just now is the relation of mediastinal involvement in cancer of the breast. In the first place, here is a woman who has been operated on for cancer of the breast. She has some shortness of breath, some rheumatic pains, most of these patients are at the age where shortness of breath comes on irrespective of any malignant disease. Can you differentiate the shadows of cancer or malignant disease from some of the shadows we see in routine examination? If you take x-rays routinely of all your patients, you will see mediastinal shadows that are very difficult to differentiate. The reason I am calling attention to this point is that there seems to be a good many cases reported of mediastinal metastases after cancer of the breast. I think Dr. Kahn will agree

with me that of all cases of carcinoma of the breast in which the mediastinal shadow is of sufficient size to justify diagnosis, we have seen no improvement in the shadow nor are any of the cases permanently cured. I think perhaps some of the improvements are due to incorrect diagnosis of the mediastinal shadow. I think there is a great opportunity for all of us to attempt to keep most accurate records, especially of shadows in the mediastinum, so that when a patient with cancer of the breast comes up for routine examination with a shadow in the mediastinum we can watch that shadow. I do not know how many of you make the diagnosis of mediastinitis, but I would like to offer a prize to any one who has proved the diagnosis at autopsy.

Of course, with this little girl it was a great disappointment to fail to cure a perfectly benign tumor. Looking back, I think one mistake we made was to operate too quickly after radiation. This child had had intense radiation and then returned. The x-ray shadow was negative and we gave a second radiation. I feel now from my experience that that second radiation was unnecessary and that if radium was going to help that child it would have shown in two or three weeks. The failure to get a reduction in the shadow showed we were not dealing with a lesion that was amenable to radium. Some of my colleagues tell me that operation should not be performed too quickly after radiation. The radiation seems to lower the vitality of the tissues. One doctor tells me of a hysterectomy performed a week after radiation and the patient died of a streptococcic infection.

This little girl was operated shortly after radiation. Remember, this child had had no pressure symptoms and she had no trouble until the swelling appeared over the sternum. When I saw the shadow in the mediastinum and the swelling over the sternum, the probable diagnosis to me was tuberculosis. When I opened the swelling it looked like tuberculosis. I think that was a mistake. The question is, was it a mistake in operating and trying to remove that tumor. Some of you have not my record of thirty years of surgery. I have looked it over. I have had a very large experience in draining large cysts in the abdomen, especially pancreatic cysts. Whatever the technique, there is danger of secondary infection. All of those cases are infected, some of them die. I feel that when I decided to operate on this girl drainage was contra-indicated. I think Dr. Stewart showed that the drainage mortality was high. We did the operation under novocaine and the child was in good condition. We resected the rib and then with one hand we separated the cyst from the diaphragm and with the other hand we separated the cyst from the lung and it looked to me as though we would be successful. The mistake made was opening it. I should not have opened it. I thought by opening it I could reduce its size. Having opened it, I had to drain afterwards. I should have attempted to remove it without opening it. Having decided not to remove it, I should have left it alone and closed the chest wall. I think the child would be living today if I had not opened it. It was the opening and draining of the cyst that caused her death.

Explanatory Note:—Dr. Kahn's article was pried in the February issue and is here printed, corrected, with our apology.



EDITORIAL

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The Torch of Aesculapius

I.

ANYTHING like a definitive effort to understand the relations of science to health for the purpose of developing an intelligent science of health requires a critical survey of history for the purpose of determining wherein science has failed, why it has failed, and what its real relation is to obvious social maladjustments. How briefly this can be done depends entirely on the ability of the person attempting it to discriminate between those incidents which have had a direct bearing on the trend of scientific development, and those which have not.

In what follows, if statements here and there seem cryptic or cramped it is because of an earnest desire to observe the natural limitations of time and space and because of a sincere regard for reader patience.

It seems wise, also, at the outset to say that the sole purpose of the allusions to religious institutions and scientific performances is to set up the essential historical facts which establish accurately the trend of all science in relation to the composite social welfare.

No thought of secular or religious controversy has any part in this discussion. The church is only mentioned because it was in the first instance, so far as records are discoverable, the preceptor of all science. And in order to draw off sound deductions concerning the social problem as it exists today, one must be fair enough to review the record as it stands, admit social and scientific failure when it obviously exists, and use those mistakes as the stepping stones to ultimate success, no matter if the facts hurt petty personal pride and give the lie to innate prejudices that have been built up in a million different silly ways.

II.

With this sort of a mental attitude only is it safe and profitable to dissect the corpse of the social body. Much of the history that is available must be first stripped of its local color before it can be viewed in its correct relation to the social trend.

Keeping these thoughts in mind constantly, the plunge is taken.

As early as 4000 B. C. history affords abundance of evidence that science, and especially that amalgamation of all science known as the science of medicine, was practiced quite universally among the Greeks and Egyptians. Indeed,

there has always existed in the human being, and possibly in many of the lower animals for aught man knows, a feeling called sympathy, which has been the dominating motive in every case of great physical and mental distress. From that feeling, it is but the natural sequence of things for man to attempt methods of relief, and when those methods have been proven efficacious in a sufficient number of cases, they at once become the priceless treasure in the storehouse of knowledge to be preserved and used in circumstances of extremity and human suffering.

Life has always been shrouded in mystery. It has been associated with all sorts of Gods—each generation has evolved for itself certain new ideas or revived certain old theories—every century has struggled to unravel the mystery and has fallen back to a blind acceptance of the thing called life as an inevitable sublimation of a supernatural power.

This was the underlying principle which brought about the practice of trephining the skull. The early Greeks and Egyptians believed that headaches were caused by the confinement of evil spirits in the skull. Carrying that belief into execution led to the boring of holes that the evil spirits might escape, and according to the available records some patients submitted to the operation as many as twelve times.

Running through the record hurriedly, each new century developed numerous other ministrations designed to ameliorate human suffering. Medical practice, or the application of medical science to the human family, in its early stages was a function of the priesthood. As an inevitable consequence, since religion in those days dominated all political and economic and social relations, it is no cause for surprise that the priesthood sought to add another prop to its topheavy structure by claiming an uncanny and supernatural power and by shrouding their most commonplace achievements in wierd incantations designed to produce an ebullient religious fervor.

Up to 410 A. D., a lapse of nearly 4,500 years, science gradually added to the sum total of human intelligence, so that it then occupied an important place in public opinion. Much thought and study had been given to it, and the church suddenly found itself in the anomalous and painful predicament of having fostered and incited a realm of thought which far outstripped the progress of intellectuality in the application of religious principles to every day life.

In the beginning of the Fifth Century it became apparent to the church that science was fascinating men because it dealt with facts, because it was able to take effects and trace out causes, because it could take causes and predict effects. The result was an increasing disinclination on the part of the rank and file of the people to accept blindly and without question all of the fatuous dogmas, ceremonial rites, financial tributes, and ignorant mysticisms which at that time formed so large a part in the church ritual.

The reaction was inevitable. Science, a child of the church, was declared as altogether too precocious by those men from whose loins it sprung. The church thought its stability and social dominance threatened. And science was accordingly sought to be smothered by its own flesh and blood. Such men as Copernicus were burned at the stake for their scientific utterances. Science was held abhorrent. The people were repeatedly admonished in no uncertain language that the only thing in life which mattered was that knowledge which made men "wise unto salvation." The peculiar power of the mystic was invoked with such

EDITORIAL

persistence that the people believed, and turned its back completely on the rational facts of human conduct. All the intellectual attainments and scientific achievements heaped upon the shrine of a toiling, moiling, and suffering humanity by the Athenians and Alexandrians were deliberately cast aside. And the iron heel of the church crunched down on the sensitive neck of the intellectual and scientific body. The priesthood exhibited a sort of unctuous virtue in its abandonment of truth for purely theoretical teaching. Even St. Paul, the Apostle, found it necessary or expedient to justify his mystic utterances occasionally, as is demonstrated by his own words that "all things count for dung but to win Christ."

III.

Mediaeval history chronicles no scientific advance. The works of Aristotle in logic, in metaphysics, in rhetoric, in psychology, in ethics, in poetry and natural history, in comparative anatomy, in systematic zoology, in embryology, in teratology, in botany and physiology; the valuable findings of Hippocrates, of Pliny, the anatomist, of Praxagoras, the clinician, of Galen, physician to Marcus Aurelius, and one of the great anatomists and physiologists of history, were deliberately destroyed.

But thanks to that indestructible bond of human sympathy, a few devotees of science risked their lives by hiding out in caves and cloisters such of the records of scientific achievements as they were able to lay hold of in the turmoil and zealous infliction of religious intolerance.

In the Thirteenth Century the orgasm of religious frenzy had subsided sufficiently that a few courageous students of the rudiments of life again picked up the golden thread which is woven out of that shimmering texture which runs through precise knowledge concerning man's mortal habiliments.

Since then, the realm of science has been in the ascendancy. Though slowly, it has surely grown day by day in public confidence and opinion, and science now stands in the affairs of the world as the equal, if not the actual peer, of all social resources. Archaeological pursuits have been so extensively carried out that the accumulated knowledge of the centuries has been made available to all men for all time, and a new era is opening out, an era in which science will again pick up its constructive labors that the social nexus may be brought to an equilibrium and an understanding of some of life's obligations become the common property of humankind everywhere.

IV.

For those desiring to familiarize themselves with the historical details of scientific development, attention is called to the lectures of the late Sir William Osler, delivered at Yale University in April, 1913, on the Silliman Foundation, and lately published in book form by the Yale University Press under the title, "The Evolution of Modern Medicine." There were six of these lectures dealing with the first beginnings of science, Greek Medicine, Mediaeval Medicine, The Renaissance and the Rise of Anatomy and Physiology, The Rise and Development of Modern Medicine, and The Rise of Preventive Medicine. Each lecture constitutes a chapter, and the whole is profusely illustrated by reproduction of some of the records of the outstanding scientific achievements on which the author builds his history.

While it may be contended that these lectures were prepared by a medical man for medical men, and should not, therefore, be accepted as true indices of the scientific trend, yet they go so deeply, exhaustively and authoritatively into the progress of all phases of science, from the historical standpoint, this sort of a summary disposition of the book cannot be well taken. They constitute what is undoubtedly the latest authentic historical sketch of science and are ex-

ceedingly interesting for any person anxious to know the exact facts about scientific development.

More than this, however, no thinking man, can read these lectures through critically without being impressed with the thought that the shibboleth of the medical profession, "To ameliorate human suffering and to prolong human life," is, in the last analysis, the mother of all scientific endeavor, and that because the science of medicine was conceived in human sympathy and understanding, it now carries a tremendous responsibility in connection with the disentanglement processes of the complex social organism.

V.

The serious student will also be fascinated by the indisputable fact that during all of the centuries for which there are available authentic data concerning man's conduct, science has kept burning the only beacon light which has offered any substantial hope for the achievement of some plan whose radiant energies may be made to illumine the path leading out of social chaos.

Quite true. The records show that sometimes this beacon light burned brightly and in full flame, sometimes feebly and all but flickering out, but there have always been on hand some ardent souls who refused to see it extinguished forever.

And no man can read intelligently of the ups and downs of science through the ages without being impressed with the feeling that The Torch of Aesculapius has always produced its beneficent reflections in the composite social welfare in exact proportion to the esteem accorded medical science by public opinion. There is an abundance of irrefragable evidence to show that the social well-being has been good, bad, or indifferent in precise ratio to the length of the shadows falling across the path of the standard bearers of medical science.

VI.

It would hardly be sensible, however, or within the precepts of true science, to pass from this premise to a conclusion without giving due consideration to three facts:

(1) Notwithstanding its precepts, the votaries of science have not accorded that degree of thought and effort to the constitution of an inclusive, cohesive, and synchronized social philosophy which the present welter so unmistakably demands.

(2) There has not been, either on the part of scientific agencies or the public, proper recognition of the fact that medical science touches, and more nearly understands, all phases of human conduct, and should for that reason be better able to act as the expressive agency of the social welfare in all matters involving human life and happiness, whether they be dubbed politics, economics, or religion; and

(3) The devotees of medical science have not sufficiently studied, comprehended, and acted in the larger spheres of human relations, because they have not observed with understanding those travails incident to the birth of a new social child requiring a wholly different conception of the functions of medical science as a social unit.

VII.

This is a startling indictment of all scientific men. It is also an indictment which should set the medical profession by the ears. But when writers on sociological and quasi-scientific subjects by the score plead for the socialization of all scientific endeavor, as this term is generally understood, and especially point an accusing finger at medical science, there is something fundamentally wrong—there is either a deliberate evasion of those social obligations impressed upon science from without, or there is a functional

disorder which produces the same result from within, because nobody has appeared in the arena of scientific endeavor possessed by the spirit of large social service offering to lead the way. Whichever the cause, the end result is the same, and one might well ask what scientific men, what medical men, have been doing all these years to justify themselves and to merit public faith and confidence in those principles they have so tenaciously expounded?

And yet, of course, scientific men, medical men, have been busy. They have admittedly labored long and painstakingly. But this is no impetuous outburst that can be stilled by the winking of an eye or the disdainful shrug of one shoulder. The difficulty seems to be that scientific men, and medical men, have been so busy with their instruments of precision and their test tubes in meeting the daily problems of life in the little sphere in which each has moved, that they have not given a thought to the larger obligation of co-ordination, of applying the simple rules of science to all scientific effort for the purpose of reducing waste and cutting out all useless duplication of effort and foolish loss of energy in their own domain.

This kind of a statement is bound to bring a storm of criticism. But with such a vigorous charge as that laid down by G. D. H. Cole, one of the latest social writers, a charge which it seems must be admitted and remedied before the present social chaos can be reduced and made to flow in that direction which will insure some decent measure of social stability, social safety, and intelligent social development, it is patent that some particular group of men—presumably scientific men, because they should know how to assemble facts, point out causes, and suggest obvious methods once the thing is gotten together in proper relation—it is patent they must assume the burden of devising a practical philosophy of life.

Listen to Mr. Cole:

"Orthodox social theory is bankrupt; it neither corresponds to the facts of today, nor affords any help in interpreting the tendencies which are shaping a new social order within the old."

Of course, Mr. Cole does not specifically accuse scientific men. Nor does he insinuate remissness on the part of medical men. But if social theory is bankrupt, it must be admitted that scientific men generally, and medical men particularly, should know the causes producing that bankruptcy, and knowing the causes, they are not functioning in full accord with their obligations unless they offer some practical plan in substitution. This is especially true of medical men, because they, of all scientific men, are the direct representatives of the individual and social well-being of all the people, and are possessed of exact knowledge concerning the effects of every individual and social degeneracy. With this knowledge, if they have not dug out the causes behind the effects they see every day, then certainly they have not risen to their job.

VIII.

Perhaps it may serve to clarify, as well as emphasize, the thought sought to be conveyed, to quote the following excerpt from the writings of Elie Metchnikoff, co-laborer with Pasteur:

"In order to modify human nature, it is necessary to realize what is the ideal in view, after which every resource of which science disposes, must be taxed in order to obtain that result. If an ideal is possible, capable of uniting men in a sort of religion of the future, it can only be based on scientific principles. And if it is true, as is so often affirmed, that it is impossible to live without faith, that faith must be faith in the power of science."

This observation was made by Metchnikoff about the time of the outbreak of the late world war. Beset with those innate impulsive emotions of his race, which were accentuated by the atmosphere in which he lived, and adured by his powers of reason developed in half a century of scientific research, Metchnikoff, thoroughly intellectualized, saw through the social upheaval to its motivating causes and put his finger on the fundamental failure of all science—the failure to rationalize human life as by constructing within the social organism itself the machinery to give expression and direction to the individual ingenuity and to avoid the cumulative explosive element by employing all surplus energy in constructive channels.

IX.

The ideal having been fixed, the task having been set by a scientific man, it is the manifest duty of all other scientific men to either disprove the principle involved or to find ways and means of applying it beneficially. Thus again does history call into question the penetrative powers of The Torch of Aesculapius, for this statement was made by Metchnikoff as a part of a general epitome of the failures of medical science.

X.

All controversial questions aside, the present social problem in all its complexities presents the single greatest opportunity science has ever had to do two fundamental things: (1) to humanize itself by the co-ordination of all scientific endeavors so that the composite result will be a matter of every day knowledge among people everywhere, people who will be quick to grasp the full import of any plan which gives assurance of political, economic and social stability and welfare; and (2) to be of tremendous service to humankind everywhere in its effort to achieve a rational, cohesive, and purposive social organization in order that man may go about his daily work with an understanding of and appreciation for the part he and his neighbor play in up-building the common good. That, surely, is a big undertaking. But nothing attempted, nothing achieved; and certainly the problem of social direction is one demanding an application of scientific principles—the only known method which seriously offers any hope for the merging of diverse personal and secular interests for the common welfare without being overwhelmed by the lunatic fringe of apostasy.

XI.

Every man of medical science is foresworn to do two things: (1) to ameliorate human suffering and (2) to prolong human life. These are traditional. Medical men have thought they saw their obligation full panoplied in curative practices. But of late years they are being mercilessly pressed from all sides to say whether the amelioration of human suffering confines the science of medicine to the mere treatment of a man's ailments once he has become sick, and whether the complementary part of the obligation "To prolong human life," has any larger meaning than that the maimed, the halt, the blind, shall be the indivisible responsibility and burden of the medical profession forever?

Reasonable minds have no difficulty in agreeing that the science of medicine is charged with a very definite responsibility concerning every thing which has to do with human perfection and happiness—general terms, granted, but inclusive, easily understood, and sufficiently elastic to prevent even the most virile and inquisitive mind from going soft through inertia applied externally.

Reasonable minds also agree that the question of health is becoming every day more profoundly important to the man and woman who is not ill—a goal which can only be fully attained through the services of the medical profession—and through the medical profession only if it travels carefully and laboriously along the social road studded with all the solid facts that have already been discovered, and

reenforced by others as they are assembled day by day through the efforts of all manner of science—a road withal whose vistas of human actions and reactions must be limned in precise knowledge of physiology, pathology and psychology.

XII.

Descartes, the ancient Greek, said:

"For the mind depends so much on the temperament and disposition of the bodily organs that, if it is possible to find a means of rendering men wiser and cleverer than they have hitherto been, I believe that it is in medicine it must be sought."

Clearly, the Ancients had no misconception of the true relation of medical science to individual development and the public welfare. It is problematical, however, whether the rank and file of the public today—indeed, it is questionable whether the medical profession itself, fully appreciates or understands the place the mother of all science must inevitably occupy in any sincere effort to build a constructive and intelligent social philosophy.

There is, of course, a very active spirit of ferment at work in the profession and out. The hue and cry about the socialization of medicine, as that term is ordinarily understood and used, is the outward evidence of a feeling that medical science is not functioning fully with respect to the social welfare. At best, that reform is but the coercive expression of public opinion—the reflex of an unfulfilled scientific obligation. But the fundamental failure of that method lies in the fact that it is, in the last analysis, a mere shifting of the responsibility for a proper and efficacious science of health from a specific scientific agency to an inarticulate and unscientific conglomeration of political and social forms.

Any student will agree with the proposition that the public welfare is paramount and that the general public should practice medicine in so far as that statement implies the possession and use of medical science in correct methods of living, hygienically, morally, physically and mentally. But this problem is not to be easily accomplished: it will not be achieved through the mere exercise of the political functions of our social institutions: the question of producing a social science of medicine is very different than the socialization of medical science.

Perhaps this distinction can be emphasized by saying that the thought projected contemplates that the original social responsibility of medical science shall be revived, and in conformity with that obligation, that medical science will develop for its own guidance and ultimate purpose an inclusive social theory. This is the only way by which preventive medicine, the new content of medical science, can assume its proper place as a modern science, and beget a wholesome social mind through the intelligent good will of the public. It hardly seems necessary to add that only through the intelligent co-operation of the public can the science of medicine become a truly socializing influence of value; and that contrariwise, socialized science as an effect instead of a cause will become hopelessly involved in political travesty and economic legerdemain.

XIII.

With these thoughts very definitely in mind, The Radiological Society is attempting to develop a Research Department for the distinct purpose of co-ordinating and correlating the scientific work of existing agencies. This department does not labor under the presumptuous belief that it should, or could if it would, set itself up as the chief architect of all science. Rather, it is very appreciative of the earnest efforts, sacrificial labors, and intense zeal of many institutions and individuals now working out specific problems.

But it seems obvious a delightful impetus can be given to all scientific achievement by the development of proper means to secure the effective liaison of all scientific agencies, whether institutional or individual in character. This is the job specifically undertaken in order that all scientific workers may be certain of the effective co-operation of all other scientists, and that there may be maintained constantly and perpetually an authoritative source of information and aid for all worthy scientific efforts having for their object the attainment of a better science of health.

XIV.

It is the desire of those persons striving to visualize this entire problem that the transition from labor to refreshment and refreshment to labor, whether spiritual, mental or physical, shall be made as easy and as certain as possible in order that stimuli can always be found in the free and untrammelled interchange of scientific findings, scientific hopes, and the differentiation of scientific obstacles. The Torch of Aesculapius must be refurbished and kept burning at full capacity so that as it passes from the hands of all scientific laborers of today to the beckoning hands of tomorrow, its effulgence will be accepted as a guarantee of a high mark of scientific attainment and the unquestioned source of an abiding faith in the fecundity of scientific principles as applied to the public welfare.

Radiology and the Physician

OPINION is widely divided upon the question of the status of physicians who are practicing roentgenology. Is this specialist to be a hewer of wood and a drawer of water, or is he to be one of the architects of King Solomon's temple? For many years varying opinions have been voiced. One school holds that roentgen workers are laboratory workers and should only record their findings accurately and impartially, leaving the deductions to others. In therapy, they maintain, the direction of the treatment should be in the hands of a surgeon, internist, or some other physician. The roentgenologist should be the servant supplying the technical skill, but having no voice in the general direction of the case.

On the other hand, from the beginning, able leaders, outstanding men, destined by a dominating personality to become successful in whatever field of medicine they might choose, have seen the narrow vision of this line of reasoning. This school of thinkers maintains that the roentgenologist's place is alongside other consultants. They should give their opinion when sought by the general practitioner, the surgeon, or whoever handles the case, or by the patient seeking advice. Members of this school have usually graduated from a ripe clinical experience, or they have had the foundation of college training, hospital service, and apprenticeship with a competent physician. The future to them is bright and hopeful if they can aspire to the position of Hiram, the chief architect, and sit meanwhile at the council table.

A close analysis of the situation shows that at the present time the specialty has passed the division of the ways. Recent advances in the field of roentgen therapeutics make it imperative for the roentgen worker to be a master of diagnosis, of therapy, and to possess a broad knowledge of the basic branches of medicine—bacteriology, pathology, general diagnosis, medicine and surgery. Already they have accepted the tedious service necessary in preparation, have accumulated a broad clinical experience, have collected a fair-sized literature and have established liaison with the leading research laboratories of the world. No other field holds more interest today than physical research and biological experimentation on the effects of the roentgen ray on animal life in health and in disease. The experience

entitles roentgenologists to the dignity of equality in the councils of peers.

To be a mere technician (and that is what the first alternative means) attracts only laymen to the roentgen laboratories and a few physicians who are satisfied with little recognition and no responsibility. It absolutely dooms the future of roentgen development to mediocrity in the fields of diagnosis, therapy and research. It renders the field barren and holds no adequate reward for the physician who plans a future.

A parallel case may be drawn from the dental profession. That specialty is the only one in medicine graduating practitioners without a medical background. Today the leading dental colleges are adopting the longer courses in order to compensate for this deficiency in training. Most of the failure in co-operation with dentists arises in their lack of proper appreciation of health and its relation to oral hygiene. This is fast disappearing. But it is illustrated when we see some of the older dentists still placing bridges, fillings and other fair-appearing indentures in mouths that are infected; indeed, putting them often on teeth that are a positive menace to health. Such practitioners are not entitled to consideration as consultants. They are technicians, not specialists in medicine.

Men in other fields of medicine who have considered this phase of the subject hold no delusions. Their attitude is helpful. The leader of one of the greatest of modern medical organizations, Dr. Franklin H. Martin of the American College of Surgeons, at the last Chicago meeting insisted in strong language that roentgen workers should develop the field of therapy and "sit at the council table," and that they should not be satisfied to be "hewers of wood and drawers of water."

The ideal roentgenologist is either a diagnostician or a therapist, or occasionally both. He has learned from experience the need of medical co-operation necessary to advance the patient's welfare. He respects the limitations of his field. He knows the immense value of his special knowledge, and he is able to direct his own line of action.

E. W. R.

Recognition of the Radio'ogist

PUBLISHED in this issue of The Journal are the after dinner speeches of Franklin H. Martin, M. D., Secretary of The American College of Surgeons, and Frank Smithies, M. D., Secretary-General of The American College of Physicians on the occasion of the annual banquet of The Radiological Society. These speeches were given in response to the annual address of Dr. Alden Williams of Grand Rapids, Michigan, retiring president, who made a strong plea for the utmost spirit of co-operation between all the component parts of the medical profession.

By way of explanation, these two speeches, and those appearing in the February issue, are published because they represent the ideas of some of the most farseeing men in the profession, and it is the effort of The Journal to make its editorial section truly representative of the best thought in medical science.

The Journal believes it can serve the whole profession by championing the ideas of such men as have something really worth while to say concerning the inevitable reconstruction of medical practice that is now taking place, particularly those whose basic point rests upon those fundamental ideals which have come up with medical science.

It is recognized, of course, that The College of Surgeons and The College of Physicians represent powerful and intelligent influences shaping the development of medical science, and for that reason The Journal is proud to give place in its editorial section to the remarks of such eminent

men as Dr. Martin and Dr. Smithies, particularly in view of the fact that each embodies in his remarks a spirit of friendliness and mutual confidence for the Radiologist.

The Surgical Viewpoint

YOUR president made mention of another society this evening and I wish to very briefly compare the organization of that society with this one. Before doing that, I wish to congratulate you upon being a society of specialists, one that has been in existence but a very short time. I wish to congratulate you because you have very little to forget and no traditions to live down.

I wonder if you realize that this society really looks deeper into things than almost any other society? That this society practically looks beyond things and through things, and the only obstruction is a common house pin or a safety pin. And do you realize that that means that your business is a simple business? It is something that is almost too good.

Do you realize that to that mechanical "too goodness" you should add idealism? That, I know you have or this society in six years could not have grown into the society that it has. No society lives on pure mechanics. No society lives on pure science. It must have an ideal.

Your president has just given a hint that you have ideals and aspirations. He wonders why The American College of Surgeons in its minimum standard has not required that the roentgenologist in the hospital be a medical man. We did not think that would be necessary, but it is something we are very glad to have suggested, and it will be written in just as soon as public opinion will support it.

This organization must realize that it is probably right on the brink of doing work the most important that the medical profession will have to do. You are probably right on the brink of therapeutic work that will mean the control and possibly the curb of malignant diseases. You not only will be the mechanism, the picture maker, the searcher after things, but you will be great therapists. Let me urge this: That you do not remain any longer simply water carriers and wood choppers and assistants, but insist that the roentgenologist be a medical man and insist that he sit in at the consultation.

FRANKLIN H. MARTIN, M. D., F. A. C. S.

The Medical Viewpoint

DURING Dr. Martin's speech I thought that societies such as this should be known not as roentgenologists, but as actinologists, a wider term embracing all of the specialties along which you serve, yet at the same time lifting you out of the picture taker, water carrier, and developer class and allowing you to sit in at the consultation table. The successful actinologist is a successful internist. I have yet to find a man, a good outstanding actinologist who is not also a good internist.

In devising the new constitution and by-laws of the society I represent, The American College of Physicians, there has been abundant provision made for the introduction into that society of properly qualified actinologists, not only giving them a chance to come in, but to sit in. Already the society has admitted a number of men whose work has been outstanding. Provisions are being made for others. It will not be long before a considerable percentage of this organization become members of The American College of Physicians.

In our classification as being set down for the first grade hospitals, we are insisting that the direction of all laboratories of actinology shall be in the hands of properly licensed, properly educated and practicing physicians. We see no reason why work on which human life depends should

have as its deciding factor a photographer, a high grade photographer, 'tis true, but nevertheless a photographer. We feel that inasmuch as the actinologist's decision is final frequently and frequently the most important factor, that this decision should be laid at the door of a properly qualified doctor of medicine.

With regard to the future of this society and medicine, Dr. Warnshuis, I think, has emphasized everything completely. If I may steal a cowslip from Professor Johnson, I may say in addition to his faith, work and service, I would emphasize what Dr. Warnshuis has already mentioned—namely, vision.

A few years ago the internist and actinologist had a position closely exemplified by the corner figures in this room. They were flying at each other's throat, held back by some unknown influence. Today I am glad to notice they have gathered in these congenial groups you see at the side, presided over by a benign deity, but yet not sufficiently secure of their positions to warrant leaving out the end picture, namely, a guard against interruption.

FRANK SMITHIES, M. D., F. A. C. P.

British X-Ray Diplomas

THERE has been a good deal of discussion among American radiologists during the last two or three years relative to the scheme adopted by the British radiologists giving physicians a special degree distinguishing them as specialists in radiology.

The real working of this scheme has been rather hazy in the minds of most American radiologists and it gives us great pleasure to give at this time the exact facts concerning it.

The Journal of the Roentgen Society, in the October number, 1921, contains an editorial with the following explanation. During the last two or three years university diplomas have been established in the medical application of x-rays and electricity, and further, a special examination has been established for persons who carry out under medical direction, the technical side of this work. This statement shows that two kinds of university diplomas are issued—one which is issued to the licensed physician who wishes to take up radiology and physiotherapy as a specialty. The university authorities give a special course to this type of applicant, part of the course being given at Cambridge and part at London, under the auspices of the British Association for the Advancement of Radiology and Physiotherapy, which is purely a medical body.

Similar diplomas are granted at the University of Liverpool, and doubtless other universities will follow in a short time. The courses are intended to supplement the scanty instruction in x-rays and electricity which is obtained by the physician during the pursuit of study for the ordinary medical degree.

In addition to this a special diploma is given to laymen who wish to become technicians. This diploma is awarded to those who have a good general education and who are willing to sign an agreement that they will not examine or treat a patient except under the direction of a well qualified medical man. The examinations for this diploma are open to any one meeting these two requirements and showing a certain amount of experience in the practical side of x-ray and electrical work. For those who have had no practical experience in this line, special courses of instruction are provided leading up to the degree. The technicians have formed an association which is known as the Society of Radiographers, the medical men being distinguished from technicians by the employment of term Radiologist. This arrangement gives the technicians assisting in x-ray and radium work recognition for their qualifications and binds them

closer to the society of radiologists. The Society of Radiographers in Great Britain has a council, the constitution of which has been approved by the General Medical Council and Board of Trade. This council consists of six medical men appointed by the British Association for the Advancement of Radiology and Physiotherapy; six members of the Institution of Electrical Engineers and six members elected from the membership of the organization. An examination is held twice yearly and the successful candidate is entitled to use the letters "M. S. R."

Of course, at the present time it is not possible for us to adopt exactly the same scheme in America, due to the different method of licensing physicians and giving diplomas to men in special societies. This arrangement, however, offers a good suggestion for The Radiological Society in working out the details of the plan which was adopted at the last annual meeting, leading to co-operation between The Radiological Society and certain technicians.

A Communication

YOU, Mr. President, are responsible for this effusion, for you asked me to write a letter that you could read to your members, and, in a rash moment, I undertook to do so, and now, when I take up my pen, I have no ideas. Vistas of wonderful scenery among the Rockies, awful heat in the trains, great expanses of the open prairie lands, vivid colors of your lovely lakes, all these things are ready to hand, but there is never a suggestion anywhere on the blank page of x-rays and the things which ought to be straight on the point of my pen. I made an attempt to write this letter some time back and it was not at all successful, but there was one thing which just escaped through the bewilderment of the luckless scribe on that occasion—an overwhelming sense of his indebtedness to all his friends on the other side for the delightful time he had in June.

I found it all intensely interesting, but my wife persisted that your wonderful country was far healthier than x-rays, even your congresses. It gave me a rather nasty feeling, however, that I was less than polite to my friends who had so much to show me and so much to teach me. I knew that I should enjoy the x-ray part of the trip, but how much I hardly knew—in this country, no matter where I go, into little one room cellar departments perhaps, there is always something to learn, and when I came to your departments it was such a dose of new ideas, new apparatus, new personalities expressing themselves in their work, that I developed an acute attack of mental indigestion, and my wife won the day easily. It was less than courtesy to the splendid work I saw to dash along as I did. Even the tortoise Englishman can sometimes move a little—this one, for instance, travelled fifteen thousand, seven hundred and sixty miles, slept in forty-two beds and was back in his own home in eighty-two days.

If I were writing to English friends who asked me to do as your president has done, I should ask, "What on earth do they want me to talk about?" knowing quite well that they would want me to talk about themselves, how nice they were, what wonderful work they did, and all sorts of things of that class, whether true or otherwise. Now, I wonder if my friends on the other side of the water are any different from the people I know? I doubt it, for my friends this side are nice people, and, having told you how I would be expected to write for them—well, I won't do it for you, and if you want butter—well, there is quite enough on both sides of the herring pond to meet all contingencies.

At one period of my existence I lived at a University Settlement in the East End of London, Toynbee Hall. The settlers there were a curiously mixed lot, a most interesting crowd to live with, and one that loved fun that was poked

directly and indirectly at themselves—perhaps it was the contrast to the drab surroundings. Quite a number were engaged in the teaching profession and great was the joy when Bernard Shaw came down one day and put out one of his sayings that was filled with a half truth. It was: "Those who can, do; those who can't, teach." I just love that saying—I am now University Lecturer in Radiology, so perhaps your president thinks I am sufficiently incompetent to take on the roll of teacher! No, I don't think he asked me to write a teaching letter, although I really don't know what he wants, when he has papers on medico-legal and other dry-as-dust subjects as after dinner fare for his long suffering members.

It beats me entirely how you long sufferers stand eight or nine hours congress meeting a day, and in an atmosphere that is a fair sample of what I expect to attain when I pass to my appointed place.

Yes, there is a big difference in temperament on the two sides of the herring pond. Our audiences would melt into thin air after three hours in such conditions—you are more long suffering and tolerant, even when people get up and talk at length in a manner that shows they do not know their work.

I wonder how you would like a congress such as I would organize—nobody has yet asked me to do it and is not likely to, so, being a free lance, I can just let my fancy roam. The congress shall be held in Glacier National Park, and shall be held at such time as the birds have finished their nesting, when the earth is full of the promise of life and things to come, when the bear-grass is bursting into flower, when the snows are giving place to verdure, when the air is full of spring and the joy of life. There we shall meet, in the real "God's own country," and we shall learn some secrets that even x-rays will not tell us, and we shall walk and talk in the fulness of health, beneath the snow clad hills. Our first aim will be to know each other's minds. We would not work to schedule and we should each have a chance of five minutes in which to air our views on any subject under discussion, and we should criticise, or if incompetent to criticise, we should be content to ask questions. If we were polite we would compliment the opener on his extraordinarily fine exposition of the subject and would then proceed to dissect his theories, and, in all politeness, call him a fool for voicing such absurd views, and thereby lay ourselves open to the opener's scathing criticism of our hopeless ignorance. And every one having tilted at some one or something would take some part. Some people would get quite cross, even angry, but smell of the kitchens would quickly dispel this, and the sight of the hills would teach each of us what little microbes we are with our views of epoch making importance—in our own estimation. The president would insist that no papers be presented after

twelve o'clock, noon, and all work should be put aside at the lunch hour. Each member would have to be on the trails or on the hills at least four hours of each day, and in the evening there would be an option between a paper by the leader of those interested in something that I abhor, say, medical politics, and a lantern lecture on the geology or botany of the district.

Enough of this foolishness—I weary you, just as much as eight hours of papers, all read to schedule in a damnable atmosphere wearied me. Yes, your congresses are so intensive that human nature is left out of account, and the effect on me was a sense of bewilderment, in which I groped again and again through the mass of A.B.C., sometimes iterated and reiterated in almost German fashion, with the result that I was dazed and could not take in the many new points. Perhaps we English are different in our receptivity, perhaps your audiences are hardened to this fare, but for the poor, slow, old-world mind, your congress was something akin to a nightmare—it reminded me of the patience I played mentally at one time when fever was on me; openings occurred but were elusive, good things were always turning up, but before I had time to weigh them, I was directed to another pack and busy looking for openings in it.

And yet I enjoyed it all, every bit of it (except my own small share and the period about it), but still more I enjoyed meeting some of your workers, seeing a little of their work, getting to know some of the personalities that often did not express themselves in their writings. Yes, this was what I enjoyed most of all in the whole trip, a trip that was brim full of interest, and varied interest at that, for all the two short months I was on your shores. To one and all whom I met I would have you express the heartiest greetings and the grateful thanks of the stranger in your midst, a stranger who was made so welcome that he felt absolutely at home. I would that we on this side had some of your freedom from self-consciousness that would let us make you as completely at your ease when you come over here, as I trust many of you will endeavor to do. To have had the privilege of meeting your workers and seeing the conditions in which you work, has been a great treat, even though one is full of envy of the obvious fact that you have the money to spend on apparatus, while we struggle on, making the metaphorical old tin can and bootlace serve a useful, if unornamental, purpose.

And so, Mr. President, having written as you bade me, I make my bow, and hope that once again I may be with you in person when you meet in congress, particularly if I may join you all in Glacier National Park or in the Yosemite Valley.

I am your grateful guest,

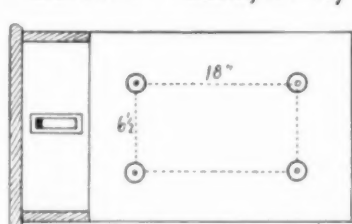
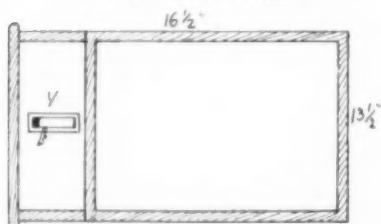
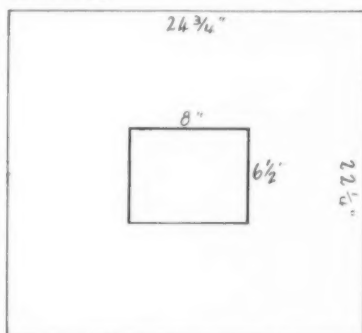
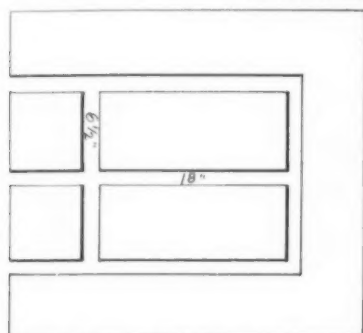
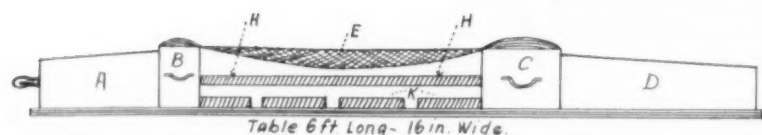
ALFRED E. BARCLAY.



DEPARTMENT of TECHNIQUE

A Modification of the Richards Table

H. H. MURPHY, M. D.,
Kamloops, B. C., Canada



Upper Surface - "Y" catch to hold in proper position for I & IV Serial.

Screw at end to tighten hammock E. A—Upholstered pad, 13 inches long. B—Upholstered pad, 3 inches long. C—Upholstered pad, 8 inches long. D—Upholstered pad, 14 inches long. E—Hammock. F—Lead covered shield. H—Central aperture. K—Track for cassette holder.

IN an article in the October number of The Journal of Radiology, Dr. L. K. Poyntz refers to the Gastro-Intestinal Table designed by Dr. Richards of Toronto General Hospital. This table, which permits of fluoroscopic observation and palpation, provides for serial stomach work in the prone position, and by supporting the abdomen in a hammock, deformity of the stomach silhouette by spinal pressure is avoided.

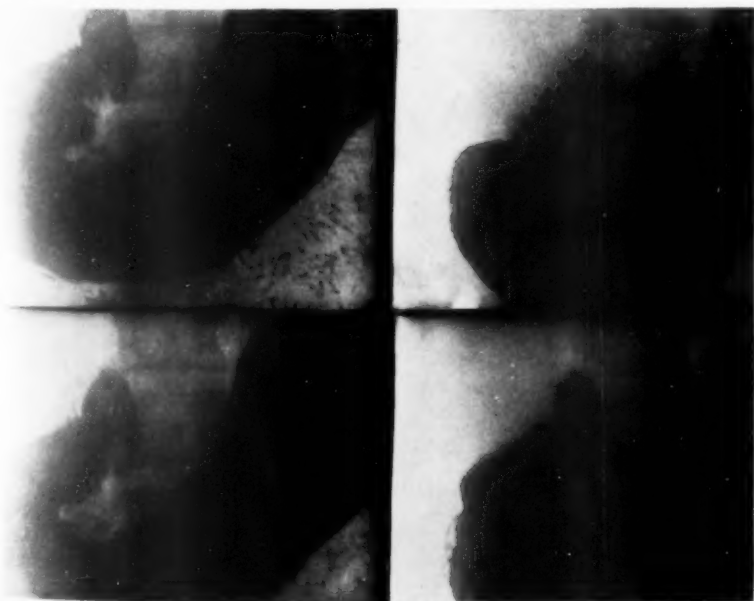
The following modification has been found by the writer to work satisfactorily, and by taking four serial views on a film eleven by fourteen there is not only a saving in material, but also an economy in the original investment of intensifying screens. It consists essentially of the Richards table and the usual eleven by fourteen serial stomach plate changing tunnel, which has been on the market for some time. The table measures sixty inches long and sixteen inches wide and can be used on any of the usual combination or wooden tables, and is equipped with four handles (on B, and C) for convenience in lifting. A and D are upholstered flat to support the head and legs, while B and C are hollowed out, five and one-half inches on the outside and three inches in the center, to support the chest and pelvis. From these supports the hammock—E—is stretched. The hammock can be tightened by screw X. H is a lead covered shield having an opening in the center eight inches by six and one-half inches. Underneath this is shown the track K for the cassette holder. After the patient has been examined in the upright and prone positions, he is placed prone on this table and the area of which serial radiographs is desired is placed, with the aid of the fluoroscope, over the opening in the lead shield. If the eleven by fourteen cassette is then placed in the holder and slid into position and held by catch Y, the first serial view is then taken, the catch released and the cassette pushed ahead into the second position; then across to the third and pulled back into the fourth.

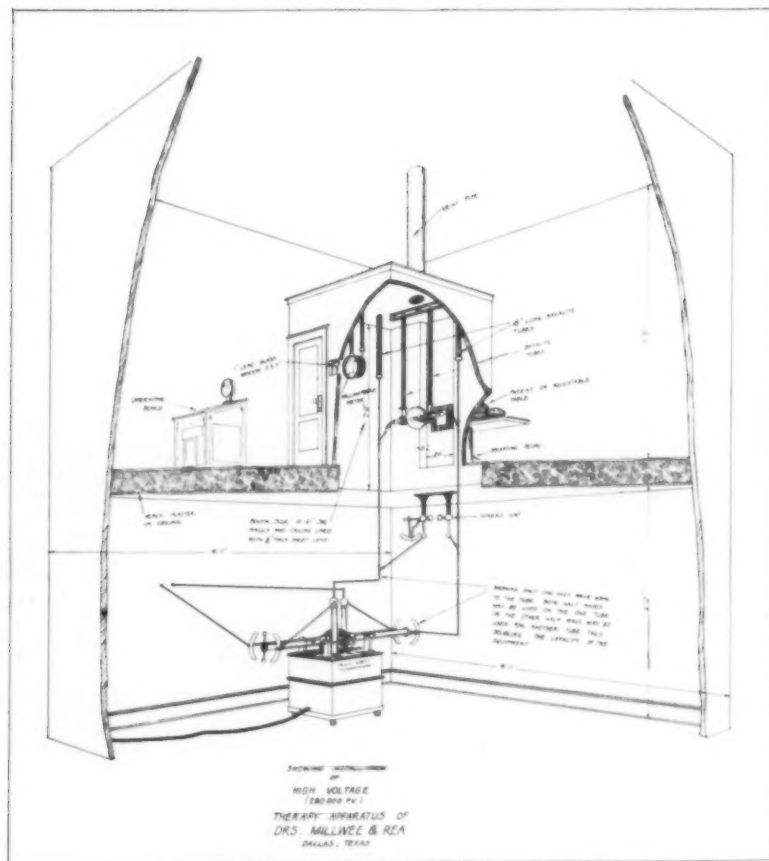
Methods of Protection in High Voltage Roentgen Therapy

ROBERT H. MILLWEE, M. D.,
Dallas, Texas

DURING a visit to roentgen ray clinics in Europe, I observed the extreme toxemias and dangerous blood changes incident to the administration of large doses of high voltage x-ray. These conditions have already been reported by various American observers.

In my own work with high voltage an attempt has been made to eliminate as far as possible, these undesirable after effects of the treatment by employing a type of installation which completely protects the patient from the dangers of electrical shock, unnecessary stray rays, noise, odor, and the sight of strange apparatus; any of which may result in con-





siderable shock to the nervous system and thereby change the blood picture or increase the toxemia.

After using this method for a period of eight months, with two hundred cases, I am thoroughly convinced of its value. Two hundred and thirty-five thousand peak volts are employed and larger doses are given than I observed in European clinics with much less toxemia and blood change. The toxemia is much less than when the same dose is attempted by either high voltage or with one hundred and forty thousand volts given in the ordinary way.

The installation is illustrated in Fig. 1, and may be installed for less money than an ordinary treatment table and tube stand.

It will be noticed that the transformer is located on the first floor of the house and the treatment room is upstairs. This is not essential as both may be placed on the same floor. The high tension terminals go direct to the tube without passing through a wall. A vent pipe in the top of the lead lined booth allows for ventilation. The lead lined wall is grounded. The lead is on the inside of the wall and the wall is composed of an inch of wood and one-quarter inch beaver board. The tube is

fixed with the target nineteen inches from inside the wall, so, with the patient against the wall it is possible to secure a twenty inch skin target distance. A thirty-six inch skin target distance is most usually employed. An adjustable diaphragm as is employed in fluoroscopic work is fixed in the wall and compression cones made of wood with a flat compression surface are employed in order to flatten the field exposed as much as possible. These cones are of various lengths and the sides are lined with leaded ray proof rubber. The length of cone used depends on the skin target distance desired. The size of the column of primary ray is regulated by the diaphragm and the leaded rubber lining of the cones absorbs the stray or scattered rays so that no ray reaches the patient except that which is directed to the pathology.

Most all patients will assume a position on the side for a much greater length of time with comfort than on the back or face. If it is desired to treat from the back or front, the patient is placed on the side, and all pelvic cases are placed on the left side and the head of the table is lowered slightly to allow the small intestines to fall out of the pelvis and the sigmoid will usually fall sufficiently to the left to be out of the more intense central ray.

An ordinary surgeon's table, with the various adjustments, equipped with an improved wood top and covered with a mattress, may be used, and it is best to have it equipped with casters so it may be rolled about. In my installation the operating switch board is placed on the opposite side of the lead lined booth from the patient and the operator observes the patient by means of a large mirror on the wall.

The transformer is constructed to operate two tubes so that another tube may be mounted in the same booth and the ray directed through the opposite wall, and in this case the operator could be placed at a distance from the end of the booth and observe the two patients, one on either side of the booth, at the same time.

Two booths could be used and the patient placed between the booths and a tube from each booth used on the one patient and thereby lessen the time of treatment. But since there is nothing to indicate that it is desirable to shorten the time of treatment, but, on the contrary very reasonable argument other than clinical evidence to indicate that it may be desirable to even lengthen the time of treatment, I do not believe that we shall very soon find the necessity of using more than one tube on a single patient.

To deliver a dose of high voltage x-ray to a deep seated malignancy, such as in the pelvis, requires about five hours treatment. Most such cases are women and past fifty years of age, and unaccustomed to such apparatus as seen in an average x-ray room. And, furthermore, such patients have most usually been informed of all the dangers of roentgen treatment. To place such a patient on the average x-ray table and with a spitting x-ray tube suspended from above, require her to remain quiet on her back for hours at a time is sufficient to shock the nervous system beyond repair.

Less than two per cent of my patients have been sufficiently toxic to vomit. I also find that my patients do not complain of taking treatment and if they have ever had treatment elsewhere, they never fail to express an appreciation of the method.

We seem to encounter greater toxic effects when the same dose is attempted with our ordinary one hundred and forty thousand volts than with the two hundred and thirty-five thousand volts, so if we are to continue the use of ten inch spark gaps for deep therapy, I believe this type of installation to be of especial importance.

A word of praise for the American manufacturers of high voltage apparatus: Two of the new high voltage Coolidge tubes have been operated at two hundred and thirty-five thousand peak volts with a Kelley-Koett transformer for a period of seven months without the slightest trouble with either tubes or transformer.



NEW EQUIPMENT

Acme Stereoscope

RADIOLOGISTS will appreciate the finer technique of the Acme Stereoscope. It has always been one of the regrets of radiologists that they have not had a stereoscope so constructed as to make possible the vertical adjustment of the mirrors. That is one of the outstanding features of the Acme Stereoscope. With this apparatus the problem of properly aligning, vertically and horizontally, stereoscopic negatives, is met by means of a knurled screw controlling the adjustment of the mirrors at any angle and another adjustment which affords a sidewise tilt. Altogether the operator with this apparatus has four different adjustments which offset variations in vision, as for example, those due to astigmatism.

The illuminating boxes of this apparatus are equipped with four seventy-five watt day-light lamps each. These lamps are so placed as to give indirect illumination, thus insuring an evenly diffused light. Sufficient ventilation has been provided to eliminate all heat. The maximum distance between each box and the mirrors is twenty-five inches. This distance is varied or controlled by means of a handle upon which a dial is mounted. The dial shows the exact distance in inches between the boxes and the mirrors. Ball bearings insure easy manipulation of moving parts.

Probably the most important feature of the Acme Stereoscope is the dimmer control or rheostat which is so finely graduated as to enable the operator to increase or decrease the intensity of light to suit his needs. This is particularly advantageous in viewing negatives which have been over or under exposed. Plates other than stereoscopic negatives can be viewed in one box by turning a snap switch which automatically disconnects the other box. All adjustments, including the dimmer control, are located immediately in front

of the mirrors, where they are easily accessible without the operator taking his eyes from the mirrors when viewing negatives.

The Acme Stereoscope is constructed en-

tirely of metal, finished in enamel and highly polished nickel. The metal frame is rigid and so compact as to conserve floor space, occupying only forty-three by eighteen inches.



Wilmot Castle Sterilizer

EVERY completely equipped office of medical and dental practitioners requires sterilizers of one kind or another. The Wilmot Castle Company of Rochester, New York, has lately perfected four models of sterilizers which may be of interest to radiologists, particularly those engaged in therapy of superficial and deep seated malignancies. The first one is a small sterilizer coming in three sizes, 10 $\frac{1}{2}$ x5x3 $\frac{1}{4}$, 13x5x3 $\frac{1}{4}$, and 16x6x3 $\frac{1}{2}$, and is designed especially for instrument sterilization. It is intended for office use and for use in wards and dressing rooms of hospitals. This sterilizer is substantially constructed. The entire bottom is cast in one solid piece of brass. The legs, faucet and lifting lever for cover are brass. Other parts are made of heavy copper and the inner surfaces are all covered with pure tin—outer surfaces are heavy nickel plated. This apparatus comes equipped with six feet of cord and

connecting plug and can be operated from any ordinary light socket. This equipment has two features which may be of interest: First, by pushing down on a lever, the cover opens and the instrument tray comes up out of the boiling water. The tray is so designed that it will not tilt or upset. Second, an automatic device which shuts off the heat before all the water is evaporated, together with an emergency switch protecting both the sterilizer and instruments from overheating.

Another new model, mounted on white enamel tubular steel stand, for the sterilization of both water and instruments, comes in two sizes. One with an instrument sterilizer 13x5x3 $\frac{1}{4}$ inches, water capacity sterilizer, two gallons, floor space 25x12 inches, and the other with an instrument sterilizer 16x6x3 $\frac{1}{2}$ inches, water sterilizing capacity three gallons, floor space 33x13 inches. This design is constructed especially for eye, ear, nose and

throat specialists and physicians requiring sterilization of water and instruments.

The model known as 1410-D incorporates all the advantages of the other designs with the additional feature that it is mounted on a frame enclosed in cabinet form, where dressings, supplies, etc., may be stored for convenient use. This model comes in three sizes, occupying a floor space of approximately 19x31 inches and contains a cabinet 9 $\frac{1}{2}$ x16x14 inches.

The fourth model is a combination sterilizer and table equipped with the standard Castle electric sterilizer in thirteen inch size, so placed as to permit the handling of sterilized materials from either the front or the side. It has a tray mounted on swinging bracket and closing under the table top when not in use. The cabinet of this model is large and will store a large supply of dressings or other material.

Spencer New Dark Field Illuminator

SPECIALISTS engaged in microscopic work will appreciate the value of the new Dark-field Illuminator lately perfected by the Spencer Lens Company. This is a combination of Darkfield Illuminator and electric lamp, making dark field examination much more simple and effective. This instrument was designed by the collaborative efforts of Major G. B. Foster, Jr., other officers of the Medical Corps of the Army Medical School, and the specialists of the Spencer Company, whose effort was to obtain a compact instrument and overcome as much as possible the difficulty so generally experienced in obtaining proper illumination.

In this device the illuminant is an integral part of the instrument. Because of the close proximity of the light source, a small con-

densing lens has been placed between it and the condenser proper. The illuminant is a



low voltage bulb, so mounted in a telescoping sleeve that it may be moved to and from the condensing lens for the purpose of focusing the light properly for the illuminating system. By means of the smaller of two sets of centering screws it may be centered to the optical axis. Larger screws provide independent means of centering the lens system.

The apparatus in question fits the substage rings of all standard makes of microscopes. The necessary current may be obtained from any lighting circuit by using a suitable transformer for alternating or direct current. Storage and dry batteries may be used. The instrument is supplied in a plush lined case with receptacles for funnel stop, light cord, slides and an extra bulb.

CASE REPORTS

CASE REPORT, H. A.

N. J. NESSA, M. D.,

Sioux Falls, S. D.

MALE. Age, twenty-seven. Occupation, auto mechanic. Family history, negative. States that he has always enjoyed excellent health. Has had many injuries to the

limbs of the body, which has caused frequent stays in the hospital.

Present complaint, pain in the region of the left iliac crest following an automobile injury.

The following plates show the presence of exostosis at the ends of all long bones; and so far as the patient knows he has had these

from the time of birth. There is no history of the patient's ancestors having any similar deformity.

He is a well developed, muscular individual, five feet, seven inches tall.

He states that for examination of this condition he has been frequently x-rayed, in the United States, as well as in Europe.



NON ROTATION OF THE COLON

N. J. NESSA, M. D.,

Sioux Falls, S. D.

MALE, J. J. Age, twenty-six. Weight one hundred and forty-three pounds. Ex-service man, referred for x-ray gastro-intestinal diagnosis with tentative clinical diagnosis of gastric ulcer.

Patient complains of stomach and bowel complaint during the last two or three years. Has distress intermittently in the epigastrium, having had on the average of two attacks monthly, each attack lasting for a few days. The distress comes on two hours after meals and is relieved by food.

Vomits occasionally; bowels constipated; has lost sixteen pounds in six weeks. Appetite is fairly good.

The gastro-intestinal examination shows the presence of a six-hour gastric residue with tenderness over the duodenal bulb and McBurney's. The duodenal bulb fails to fill evenly.

In studying the head of the barium you will note that the filled colon is on the left side. This when observed in twenty-four hours, as well as being injected by a barium enema, shows the entire colon on the left side.

The diagnosis in this case was suspected duodenal pathology with the associated anomaly, namely; non-rotation of the colon.

CASE REPORT

A. F. TYLER, M. D.

THE following case report is of interest because of its rarity and because of the unusual termination.

Mr. K. C. Age, twenty-nine. Came complaining of pain in the liver region, referred through to the back under the right shoulder blade. When he is working, if required to stoop much it brings on the pain. Physical examination showed nothing of importance ex-

CASE REPORTS

cept that pressure over the region of the cecum produced pain, which he located higher up under the costal margin. Upon pressure in the cecal region the patient would exclaim that that was the kind of pain he had from stooping.

X-ray examination revealed a calcareous deposit measuring about one-half inch in diameter, in the center of which was imbedded a steel pin, the point of which extended out beyond the calcareous deposit. The calcareous portion could be moved about by pressure on the abdomen over the region of the cecum, while under fluoroscopic visualization. By



manipulating the pain could be definitely produced.

The patient refused surgical interference, but a few months later, while under heavy muscular stress, he was taken with a sudden pain in the abdomen, after which he felt very sick, and within a few minutes he had a large stool composed mostly of pus. The second stool produced pain at the rectal sphincter, and in a few minutes the enterolith containing the pin passed with the stool.

The accompanying illustration is a radiograph made of the enterolith after passage from the body.

CASE REPORT

A Case of Unusual Bone Formation in the Region of the Elbow Joint.

H. H. MURPHY, M. D.
Kamloops, B. C., Canada.

MISS L. B. Unmarried. Age, thirty years.
This patient was referred to me by Dr. R. W. Irving for roentgen study. She com-

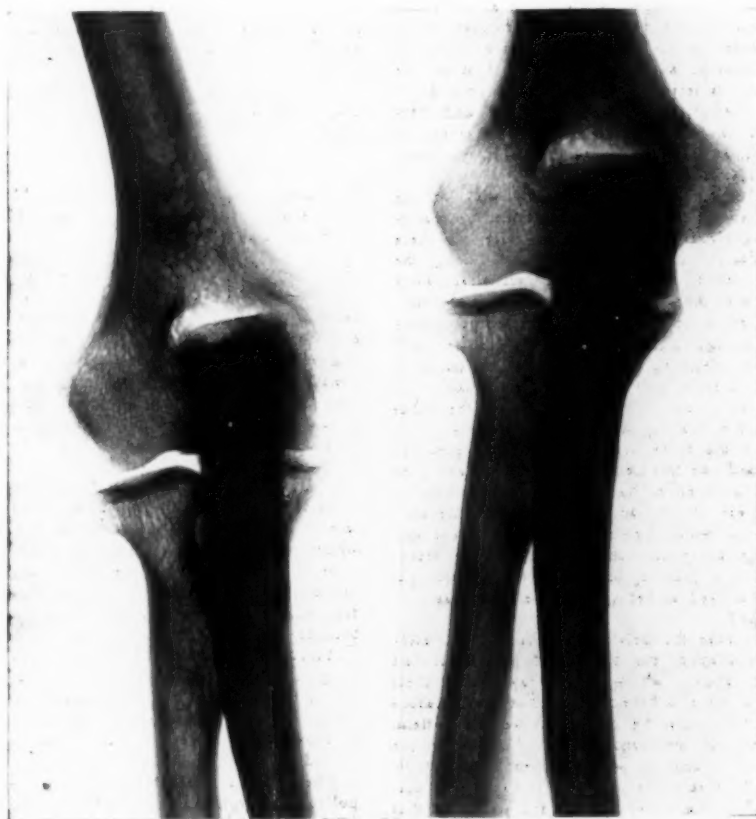
plained of pain over the external condyle of the right humerus. She is a stenographer and in reaching for a letter file, struck her elbow on the door of a safe three days previously. She gave a history of having injured the same region in the same manner a year previously. Pain and tenderness had persisted for some days and she had experienced "rheumatic" pains at times since.

Around the region of the external condyle of the humerus there was some swelling, marked redness and tenderness so that a clinical diagnosis of periostitis would have seemed justifiable. Fig. 1. is from a negative taken at this time. An exact diagnosis was difficult, as the small mass slightly attached to the external condyle did not have the appearance of either a recent fracture or of an un-united fracture of one year's standing.

The only other possibility considered was that of the traumatic type of myositis ossificans mentioned in Rose and Carliss Surgery, eighth edition, page 416.

In case that it was a recent and atypical fracture, the arm was placed on an internal angular splint, and Fig. 2 represents a print from a second negative taken when the splint was removed. It will be noticed that the question of diagnosis was now further complicated by the almost complete disappearance of the formation in question. All that is visible in Fig. 2 might be explained on the diagnosis of an ossifying haematoma, but this does not explain the mass present in Fig. 1. If this was an un-united fragment following fracture one year previously, then why the rapid absorption when the joint was placed at rest? If it was actual new bone formation of one year's duration, its disappearance is equally difficult to explain.

The three days which elapsed between the second injury and the taking of the first radiograph is quite insufficient for this formation, and if it was the result of fracture, we are again at a loss to account for its rapid absorption.



ABSTRACTS *and* REVIEWS

Pelcography: Its Field and Its Limitations. James G. Van Zwaluwenburg, M. D. *Journal of Radiology*, March, 1922.

A DIRECT comparison between exploratory laparotomy and pneumoperitoneum is not justified, in the author's opinion. If the earlier data of the former method were compared with the data obtainable on pneumoperitoneum the comparison would be more nearly fair. The information one may hope to gain by either method must be taken into consideration and not simply the dangers of the two methods compared.

On the other hand, proponents of inflation are under obligation to prove that their method is much less dangerous than surgical procedure because of the fact that the information obtainable by the x-ray is less than that by laparotomy, and until the method is in use longer its lesser danger cannot be proved.

Something over three hundred and fifty cases have been inflated at the University of Michigan Hospital up to date, with no harmful results of any kind.

The introduction of gas by way of the uterus is free from objections ordinarily brought against abdominal puncture, but there is danger of carrying infection along the fallopian tubes and into the peritoneal cavity and also there is danger of inducing abortion. Therefore, in all cases of suspected pregnancy a thorough clinical examination must be made before deciding on the method of inflation. The uterine method furnishes valuable information as to the condition of the tubes and the bearing of this upon sterility.

Of the three hundred and fifty cases examined one hundred and fifty-three have been confirmed either by operation or by time in the case of pregnancies. In all cases the conclusion was drawn from the stereoscopic image alone—an unnecessarily severe test—though a joint opinion with the gynecologist was arrived at before any operation was performed.

Because the pelvic cavity is approximately cone shaped, the bundle of rays must fall from above, otherwise the ray would meet the pelvis at a broad angle. For these reasons the tube must be placed above the patient. The most important feature of the technique is the inclination of the patient to the horizontal because the uterus must hang fully suspended from the floor of the pelvis so that the ray will fall vertically in the axis of the uterus. This position is not possible with every case. The bladder and colon must, of course, be empty.

In the case of large tumors clearly of pelvic origin, and in uncomplicated pregnancies, there is little to be gained by this method. On the other hand it is possible to confirm the opinion of the gynecologist that an obscure abdominal mass is not of pelvic origin. Dermoid cyst and pelvic abscesses have been found in normal pregnancies with no harm from inflation.

The demonstration of a normal pregnancy presents least difficulty between the sixth and the sixteenth week. After that or before the method is either useless or superfluous.

Ectopic pregnancy has presented difficulties in this series through the diagnosis of an ectopic pregnancy has been corrected to read complication by extrauterine condition.

The method has several bearings upon pelvic tuberculosis, also the patency of the tubes in

sterility and a negative diagnosis in the case of neurotics are valuable contributions of this method.

The pelcogram is singularly sensitive to relatively slight changes in morphology and relationship of the pelvic organs and so the pelvis which appears normal to the sophisticated x-ray eye is without significant pathology.

The best evidence of the value of the method is the attitude of the Department of Gynecology of the University Hospital, which refers selected cases in undiminishing numbers to the roentgenologist, and staff disputes, are being constantly settled in this way.

Co-operation between the roentgenologist and the gynecologist is imperative and has existed in unusual degree at the University Hospital.

A more complete discussion of this subject was under way at the time of the author's death.

Pulmonary Syphilis. Frank Conlin, M. D., Omaha. *Journal of Radiology*, March, 1922.

A RESUME of the literature is first given. Fowler's classification of the forms of the hereditary and of the acquired type are given and followed by a description of each.

Diagnosis of pulmonary syphilis is a diagnosis by elimination, as there is nothing absolutely characteristic in the clinical history or physical signs. Often a supposedly pulmonary tubercular patient dies for lack of anti-syphilitic treatment.

Pulmonary tuberculosis and syphilis may co-exist. Tuberculosis affects the apex and later the apex and lower lobe of the lung, while syphilis is more likely to involve the hilus and the base. Tuberculosis tends to cavitation and syphilis to fibrosis. Syphilis frequently causes stenosis of the trachea and bronchi, while tuberculosis seldom does. Tuberculosis lesions are common, syphilitic lung lesions are rare and syphilis is more frequently unilateral and circumscribed than tuberculosis. A review of the literature fails to show that spirochaetae have been demonstrated in lung tissue.

The x-ray is invaluable in the diagnosis of pulmonary syphilis. It frequently shows a flame shaped shadow about the region of the hilus with fibrous shadows running out along the septa; while this is not absolutely characteristic it is very different from the shadow cast by pulmonary tuberculosis.

The physical signs and symptoms are dependent upon the location and character of the lesion. The absence of the tubercle bacillus upon repeated examination, a history of syphilitic infection plus other manifestations of syphilitic infection in other parts of the body, a positive Wassermann reaction, the good appearance of the patient contrasting with the gravity of the physical findings and the severity of the symptoms are all things which aid in the diagnosis.

Prompt anti-syphilitic treatment brings surprising benefit to the patient.

Pulmonary syphilis renders the subject more liable to pulmonary tuberculosis, which will pursue a very rapid course if the syphilis is active and virulent, but if it is an old syphilitic infection the case may be without fever and tend toward the chronic fibroid type.

In treating pulmonary syphilis co-existing with pulmonary tuberculosis the use of potassium iodide must be guarded.

It must be understood that subsidence of symptoms and a clearing up of physical signs does not mean a cure. The blood Wassermann test and the spinal fluid Wassermann test must remain negative for several years after the last anti-syphilitic treatment before the patient can be pronounced cured.

A detailed case report is given. The x-ray and the blood Wassermann test bore out the suspicion that it was a case of pulmonary syphilis. Treatment by novarsenobenzol, mercurial inunctions, and potassium iodide resulted in the entire disappearance of clinical symptoms and physical findings and a gain of forty-six pounds in weight at the end of a two and one-half year period. The Wassermann test still gave plus three, but the patient considered himself cured and declined further treatment.

X-Ray Spectra Produced Under Various Experimental Conditions. William Duane, Professor of Bio-Physics, Harvard University. *Jour. of Radiology*, March, 1922.

RECENT research in radiotherapy indicates that much can be gained by the employment of penetrating x-rays in the treatment of certain diseases in which the diseased tissues lie some distance below the skin. As a rule x-rays of short wave length penetrate further than x-rays of long wave length. Examples are given in which matter of high atomic weight absorbs short rays to a much greater extent than it does long rays. In tissues the rays ordinarily used carry with them and deposit at a distance below the surface more radiant energy, as compared with the amount absorbed by the skin, if they have short wave length than if they have long. This is due to several causes; if the primary beam consists of short wave length rays it will penetrate intervening tissues more easily and also the secondary and tertiary radiation that comes from surrounding tissues will bear a greater ratio to the primary beam; further, the fraction of the energy of the cathode rays transformed by the x-ray tube into the energy of x-radiation increases markedly as the wave length of rays decreases, and lastly, a much larger portion of the x-radiation passes through the filters if the primary beam contains x-rays of very short wave length.

Thus, it becomes a problem of primary importance to study the spectra of x-rays produced under various conditions. Particularly for deep therapy there must be determined the best method of generating very short rays and of filtering out the long ones.

The author gives an account of some experiments on the spectra of x-rays that have passed through certain filters. "The first examples illustrate normal absorption of the x-rays (absorption increasing with wave length), then abnormal absorption where the x-rays of short wave length are cut off by the filter to a much greater extent than are x-rays of longer wave length." Experiments on the spectra of x-rays produced by different methods of exciting the x-ray tube are described. In particular the spectra produced by a constant non-fluctuating voltage and by an alternating voltage have been compared with each other.

ABSTRACTS AND REVIEWS

The apparatus and method of investigating the spectra are described and the apparatus illustrated. Emphasis is laid upon the location of the tube and the spectrometer and the position of the target.

Calcite was used as a reflecting crystal in these experiments. It was set at varying angles (and the ionization chamber at corresponding angles), and by measuring the ionization current for each angle data was obtained from which curves were drawn to represent the x-ray spectra. A constant voltage of one hundred and sixty-one thousand volts drove a current of one milliamper through a Coolidge tube with a tungsten target. The absorber (or filter) consisted of a sheet of copper .48 mm. thick. The crystal used was equivalent to about 1.5 mm. of aluminum.

With the aid of illustrations the interpretation of the spectra curves is given.

All chemical elements have characteristic wave lengths at which abnormal absorption occurs. Data has been obtained at Harvard and ionization curves drawn that determine the positions in the spectrum of these characteristic wave lengths for almost all of the chemical elements.

The character of the exciting voltage is shown to have great importance in the estimation of dosage.

Examination of the spectra of the x-rays produced by each type of generating plant is recommended as the safest plan to follow.

The Control of X-Ray Therapy in Hyperthyroidism by the Basal Metabolism Test. H. M. Jones, Ph. D., University of Illinois. *Journal of Radiology*, March, 1922.

THE metabolism of the human organism may be defined as the sum total of the chemical changes going on in the cells of the body. To measure the rate of metabolism it is necessary to measure either the rate of heat production or the rate of chemical interchange above mentioned. This reduces to the task of measuring the oxygen intake. The final result is stated in terms of a plus or minus per cent of the patient's so-called normal rate.

Muscular effort and food absorption have an effect upon the rate, therefore the test is preferably given in the morning before breakfast, and with the patient lying down for from twenty to thirty minutes before the test is made.

A concise table giving rates of metabolism for both sexes and for ages from six years to eighty has been compiled by Aub and DuBois. Any deviation of ten per cent from the normal rate is the basis of diagnosis for some twelve to fifteen pathological conditions of which there may be combinations.

The test is used only for diagnosis of thyroid and pituitary abnormalities because the diagnosis for other conditions in which it might apply is more easily made by other means.

It must be kept in mind that in a suspected case of hyperthyroidism these other pathological conditions may be effecting the metabolic rate, and also that in the presence of symptoms suggesting some other pathological condition the basal metabolism test is the only means of recognizing the beginning of hyperthyroidism.

Froelich's syndrome can often be distinguished only by means of the test. Addison's disease is often confused with myxedema and thyroid therapy controlled by metabolism determinations will differentiate these.

The test is most valuable in border line cases. As to its being an index to operation the Mayo brothers believe that a patient showing a metabolic rate of plus forty per cent with an upward rate is a more dangerous risk than one with a rate of plus sixty and

a downward rate. Age, nutrition, condition of the heart and other factors must also be taken into consideration.

The surgeons' objections are that much of the gland may be destroyed, thus causing hypothyroidism, also many patients show no response to the treatment and the delay is made at the expense of myocardium. The radiologist in reply objects to surgery on the same grounds.

Personal opinion and wrong diagnosis at the outset is responsible for many false conclusions. Also irregularity of dosage and variations in technique have led to a multiplicity of opinion for and against roentgen ray in hyperthyroidism.

The secretion of the thyroid is unquestionably diminished by x-ray treatment, and, following wrong diagnosis, havoc has sometimes been wrought. Too small or too large dosage likewise brings disaster. A more perfect dosage is yet to be developed.

The advantages are summarized as follows: No fatalities, no scar, no interference with the patient's occupation, it is painless, and if it is unsuccessful an operation will be less difficult.

Means and Aub believe that surgery should be employed only after roentgen rays and other methods have failed. Some one hundred or more investigators show that the roentgen rays have a curative effect on hyperthyroidism.

The most important uses of roentgen ray in these cases are in treatment of those showing a minor degree of toxicity and reducing the toxicity in more severe cases previous to operation.

A Philosophy of Social Progress, by E. J. Urwick, M. A. (Oxon), Director of the School of Sociology, London; Tooke Professor of Economic Science, King's College, University of London, and President of Morley Memorial College, London. Published by Methuen and Co. Ltd., London. American rights, George H. Doran and Company of New York City. Second Edition Revised.

THERE is something strangely fascinating about this book. The author meticulously examines all of the social aspects from which the usual approach is made to the large problem of modern society by sociologists, economists, and religious savants. In a very precise way he points out the deficiencies and limitations of each reform program and shows that there is lacking in all of them that binding philosophy of life which opens up the well-springs of spiritual attainment.

But a thoughtful reading of this book leaves one with a feeling that while Dr. Urwick so carefully prescribes the limits of dogmatic science, whether medical, political, economic, religious, or social, as a premise for his argument that real social progress cannot be accomplished except by the painstaking development of a philosophy which is based on recognition of the fact "that the supreme purpose of human life, whether individual or social, is a spiritual purpose, even as the sole interpretation of its significance is a religious interpretation," still he unconsciously displays a feeling that perhaps science may yet shake off its chains and provide the machinery for the consummate expression of human life, intellectually, physically and spiritually.

A comparison of two or three excerpts may clarify the point sought to be made:

On page 201, in the chapter entitled "Real Purpose of Social Progress," he says:

"We will and must work to make any one healthier—not in order that he may be a more efficient person, or a more fully satisfied self, but in order that he may be better equipped to be a victor in

the fight against the world, the flesh, and the devil. * * *

It would seem that, for ordinary purposes, here is a distinction without a difference, for it is hard to conceive an effective health program which contains no resulting physical or mental efficiency, or no self-satisfaction.

Again, on page 211 of the same chapter:

"And if the medical specialist or any other specialist informs us authoritatively that this or that remedy will produce this or that desired improvement of health or welfare, then it is difficult to avoid the adoption of the measure recommended as a part of that universal provision of the conditions of well-being which every civilized community is constantly increasing."

So that in the one case the author in effect denies the larger possibilities of science, while in the other he recognizes the value of the medical specialist's advice when it comes to the question of individual and social health.

And finally, in the last chapter of the book, the last paragraph, on page 239, under the head of "Final Criteria of Social Progress," Dr. Urwick sums up his entire argument with the statement:

"We aim at making social life more perfect—the right aim, of course. But we interpret this to mean that social life is to be made easier, simpler, pleasanter—qualities which have nothing to do with the true purpose. We know, of course, that society will never be perfected, any more than will any of our environments, from our bodies to our churches. But we refuse to see that this continuing imperfection is a necessary part of their excellence as material for our wills to work upon. We think that by our hygienic and therapeutic ingenuities we are going to make society healthy; by our economic ingenuities to make it better off; by our political ingenuities to make it contented. If these desirable results occur, it will not be from these causes, nor from any ingenuities whatever."

Wherefore, to escape the accusation of subscribing in these words to the doctrine of whatever is, is right, and whatever is to be, will be, Dr. Urwick adds:

"Most probably they will not occur; we may escape from cholera and typhus only to find our health threatened by greater nervous instability; we may increase wealth tenfold, only to find a growing consciousness of want permeating our whole community; we may establish good government and good management, only to find unsuspected forms of social unrest producing new and harder problems of social adjustment. For that is the way with our ingenuities; they are never quite ingenious enough to solve any of the problems of life. * * *

Which, stripped of all useless verbiage, is to say that one may as well die with a known ailment with equanimity rather than to fly to evils he knows nothing of.

That is why the author concludes a social philosophy which will carry all men through is paramount in importance. And perhaps that is why, too, he turned to an intangible and unscientific thing for the answer to the great social problem rather than to attempt the laborious and perilous job of marshalling the forces of all science into a comprehensive and intelligent program to achieve those things which the author admits are essential to the social welfare. But that is to beg the question at issue. That kind of a program is not sufficiently didactic to be applicable with any force in a practical world.

However, it is not the purpose of this review to enter into a long-winded discussion

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of the fallaciousness of so summarily disposing of such a vital problem. The thing in which the readers of *The Journal of Radiology* are, or should be interested, is the fact that Dr. Urwick stresses the question of public health as the point of entrance to any real study of our socio-economic and workaday customs. And having done this, he lays a heavy burden upon the medical specialist by saying that when the latter speaks authoritatively, his recommendations should become a part of the daily regime of life.

All which emphasizes the responsibility which the votaries of medical science carry as a factor in social life, a science which can if properly and intelligently directed and made to function, do much toward developing and bringing into existence that "Philosophy of Social Progress" which Dr. Urwick so keenly appreciates to be the only thing which will give a sense of deliberate purpose to, and establish a reasonable degree of security in, individual and social effort.

Without splitting fine hairs over the questions raised and discussed, Dr. Urwick's book is well worth reading. It gives an entirely new view concerning modern sociology, and whether one agrees with him or not on some of the issues raised, he cannot study the book thoughtfully without perceiving that the author is a clear thinker in the main, is a keen analyst, and is trying to focus his vision on an orderly and articulate social structure.

Social Theory, by G. D. H. Cole, Fellow of Magdalen College, Oxford. Published by Frederick A. Stokes Company of New York.

"I assume that the object of social organization is not merely material efficiency, but also essentially the fullest expression of all the members. I assume that self-expression involves self-government, and that we ought to aim not merely at giving people votes, but at calling forth their full participation in the common direction of the affairs of the community."

"* * * Orthodox social theory is bankrupt; it neither corresponds to the facts of today, nor affords any help in interpreting the tendencies which are shaping a new social order within the old."

WITH these stinging words the author closes a book which challenges attention by reason of its careful analysis of the present social imbroglio, and because he so exactly and clearly defines such words as "Community," "Society," "Association," "Institution," "Custom," "Family," and "State"—words which roll off the tip of men's tongues glibly and interchangeably without any particular thought being given to their derivation, their source, or their proper application in a sensible discussion of the complex problems of human society.

According to the author, and one can hardly deny the assertion, much of the present puerility of modern social theory grows out of a desire to personify the State. When, as must be realized on sober second thought, the "State," like all other common institutions, is nothing more than an association of individuals created for a distinct common purpose. Following the same line of reasoning, Mr. Cole correctly concludes that the family, the church, the political party, the social club, the town, are likewise associations of individuals, differing in degree, but not in kind; and that, therefore, they cannot be imbued with the power to think for the individuals constituting them. Their sole purpose is to perform such specific functions as are vested in them by the common will of the persons composing them.

The author discusses one after another the forms of social theory, their functions, and their underlying motives from the social, the political, the economic, and the religious viewpoint. The book appears to be truly the work of a master mind, grounded firmly in a correct understanding of the principles of human conduct.

In a very adroit and yet a vigorous manner, Mr. Cole strips the various social units of all the over-all and over-awing influences and powers sought to be invoked by the proponents of state socialism of every kind, divests the state as a political organism of that omniscient sovereignty which so many social theorists employ as the basis for the pretty picture they paint in an effort to get the individual to relinquish his birthright, and without carrying his argument to the point of personal effrontery by unnecessary insistence that the reader may have been guilty of misuse of the terms or misunderstood the actual theory of government, convinces him by sheer logic and simple reasoning.

This book is of particular value to the medical profession just now because there is so much agitation for the practice of state medicine in a number of forms. To read the book is to get at once a clear perception of the weaknesses of that kind of a program, and to make the reader absolutely adamant to the specious wiles used by the proponents of that particular brand of social theory. A little thoughtful study of the facts and principles Mr. Cole so definitely sets up will help one very materially in arriving at a sound conclusion concerning both the social aspects of his professional obligations and his individual duties as a good citizen.

Hyperthyroidism, Basal Metabolism and Radiotherapy. H. W. VanAllen, M. D. *Journal of Radiology*, February, 1922.

HYPERTHYROIDISM is a much more common condition than is generally supposed, and in many cases no appreciable enlargement is present even when a plus result is given by the basal metabolism test. Many of these cases are diagnosed as neurasthenia or as disease of the heart muscle.

Too much attention has been focused upon "characteristic symptoms" and too little upon the lesser symptoms of nervousness, unusual perspiration, staring eyes with almost entire absence of blinking, mental irritability, and slight but gradual loss of weight. The patient may be almost invalidated and only obscure symptoms be present. It is in such cases that the basal metabolism test is invaluable.

In treating these cases there is a proper dosage which must be observed or the result will be a failure. The author's technique is three and one-half milliamperes, fifteen minutes, four and one-half mm. aluminum filter, eight and one-half in spark gap, sixteen inch distance, six treatments on each side of the neck (twelve treatments in all) given twice per week. This has been used for years with excellent results. Though a few cases have had to be re-treated, no case has had myxoedema and there have been no deaths.

The author believes the basal metabolism test should be given in all cases where a diagnosis of hyperthyroidism is made and in all cases of obscure nervous or suppressed cardio-muscular disease.

The test should be given while the patient is in a state of mental quietude and physical rest. The home or the laboratory is a better place than the hospital as a rule because a trip to the hospital is for most people a cause of at least some degree of excitement and nervous strain.

After the first test no further one is required until at least a month after the last treatment has been given; the pulse is relied

upon to indicate changes in the condition. Charts are shown to illustrate the accuracy of the pulse as an indication of the effect of treatment.

Roentgenology in Primary Cancer of Lung. Russell D. Carmen. *Medical Clinics of North America*, September, 1921, p. 307.

PRIMARY cancer of the lung occurs infrequently, but often enough to make its diagnosis of importance. The clinical evidence often fails. The roentgen evidence is of great value.

The growth may arise from:

1. Bronchial epithelium.
2. Bronchial mucous glands.
3. Alveolar epithelium.

Two types are found at autopsy:

1. A mass surrounding a bronchus.
2. A mass invading large portions of the lungs.

Complications often arise and present other pathological conditions:

1. Metastases.
2. Atelectasis.
3. Circulatory stasis.
4. Pneumonia.
5. Pleural effusions.

The roentgenologic types are in the main two:

1. Those which are lobar. These are extensive and may be accompanied by metastasis. This type may at times be miliary in origin.
2. Those which are principally hilar. This type is either rounded or irregular and with projections.

The extensive, dense, lobar shadow attended by smaller shadows of metastasis is pathognomonic. All other types require careful interpretation in the light of clinical facts.

E. W. R.

X-Ray Radiotherapy. General Surgery. Cancer of the Breast. Practical Medicine Series, 1921, p. 26.

THE lethal dose for cancer cells has been investigated by Prince and Wood. It requires between five and seven erythema doses of filtered roentgen ray to kill highly malignant sarcoma or carcinoma in man when it is near the surface. Every centimeter of tissue that covers the growth makes an additional amount necessary. Basal cell tumors and lymphosarcoma are much more susceptible to the rays.

F. H. Johnson in the *British Medical Journal* advises roentgenization of pre-operative cancer of the breast in order to weaken the malignant cell and to increase the resistance of the tissue as a whole. It is best to be careful and not overtreat, or the cells become stale and lose their resistance. Three weeks is sufficient time to produce a definite effect. His experience is derived from (1) cases of recurrence in the other breast after operation; (2) tumors in old people refusing operation, and (3) where the surgical risk is too great. He finds that pain grows less and the tumor decreases in size. His doses are small and frequent. The tissues are stimulated around the cancer. Post-operative treatment is not contraindicated.

Where operation is contraindicated the good effects are beyond doubt. Pre-operative treatment does not make surgery more difficult. To wait two or three weeks for operation is worth while, for the tumor is improving, and if the technique is good it is not spreading at a depth. Operation should be at the crest of the wave of improvement before the tissue resistance falls.

Recent studies show that a heavier filter of nine minimal allows the dose to be increased to nine minutes without injuring the skin. These rays seem more destructive to cancer

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cells and operation can be made in five to ten days after a period of rest.

E. W. R.

The Thyroid. General Surgery. Practical Medical Series, 1921, p. 226. M. J. Hubeny, Chicago.

X-RAY treatment of exophthalmic goiter is not to supercede surgery, but rather it is preferred in certain types because the percentage of cures is as great as following surgery. The earlier the cases are treated, the better the results. Favorable signs are lessening in nervous symptoms, lowering of the pulse rate, and disappearance or improvement in the exophthalmos. The goiter might or might not decrease in size. In ambulatory cases there is no interference with the daily occupation. In marked thyrotoxic cases it is essential to regulate diet, to provide for mental and physical rest. Focal infections should be removed and special attention paid to the teeth. Some of the undesirable and dangerous possibilities were hypothyroidism, telangiectosis, and atrophy of the regions treated. Telangiectosis is more liable to occur in young women, and also if the filtration is insufficient or if erythema is produced several times.

In discussing this paper, A. J. Ochaner stated that fifteen years ago this treatment was suggested. Many cases improved, but none of them seemed to show permanent improvement. Now the case is different. The technique has been worked out, the physics is understood, and by giving attention to the thymus gland something definite can be done.

E. W. R.

The Influence of Roentgen Rays on Gastric Secretion. Wachter. Strahlentherapie, Vol. XII, No. 2.

THE acid value of the gastric juice is influenced by x-rays. If a sufficient quantity of radiation is applied normal acid values diminish, hyperacidity comes down to normal, and where a stimulative dose is applied conditions of anacidity can be cured.

A. M. P.

Roentgen Therapy in Illy Functioning Gastroenterostomy. Lenk. Wiener Medizin. Wochenschr., 1921, No. 37, p. 451.

BASED on the studies of Wilms that the x-rays have a sedative effect on spasms, the author applied x-rays to illy functioning gastroenterostomies, being of the opinion that only in a small number of the cases the condition is brought about by mechanical obstruction and in the great majority the disturbance is due to spasm. Of the nineteen cases treated with x-rays thirteen gave splendid results, two cases did not respond at all, and upon reoperation were found to be mechanically closed, and a few others are still under observation. The cured cases showed no recurrence of the trouble for over a years time. The author suggests that the antacid effect of the x-rays may be responsible for the good results.

The technique is simple: The stomach region is divided into three fields, two anterior and one posterior, each field getting three-fourths erythema dose through five to six mm. aluminum filter.

The author suggests the use of irradiation to prevent the formation of a jejunal ulcer in the gastrojejunal region.

A. M. P.

X-Ray Treatment of Benign Hypertrophy of the Breast. A. Mayer. Strahlenther., Vol. XII, No. 1, p. 139.

A CASE of a multipara. The first two pregnancies were normal. During the third pregnancy the left breast became enor-

mously enlarged and the right breast underwent a lesser enlargement. Roentgen treatment was applied. The left breast was divided into four fields, three fields were treated immediately and the fourth field was treated four weeks later. After four weeks the whole breast, which had markedly receded, was treated now in one field, and the breast returned to normal. In a further pregnancy the same breast underwent a similar enlargement, but another course of treatment brought it to a standstill.

A. M. P.

The Roentgen Examination of the Trachea in Diseases of the Thorax. Max Segalitz. Arch. f. Klin. Chir., Vol. CXX, No. 4, p. 967.

STUDYING the trachea in two roentgenograms taken in perpendicular positions to one another, we are able to ascertain all its changes in position and form. Abnormal positions or compression of the trachea are observed in various diseases of the neck, chiefly in tumors of the thyroid or of the lymphatic glands; but they are also common in diseases of the mediastinum as well as of the lungs. The position of the trachea is of moment in differentiating between an aneurism and a mediastinal tumor. Aneurisms usually displace the trachea in a lateral direction, while mediastinal tumors displace it chiefly in an anterior and posterior position. Strong compression of the trachea which is usual in mediastinal tumors occurs but rarely with aneurisms. If in a case of fibrosis of but one lung the trachea is displaced not only laterally, but also brought close to the thoracic wall anteriorly or posteriorly, the case is often mistaken for a cavity on percussion and auscultation.

A. M. P.

Aneurisms of the Aorta and X-Ray Diagnosis. L. Moreau. Arch. D'Elect. Med., Nov., 1921, No. 470, p. 325.

THE author calls attention to the fact that while aneurisms are easily diagnosed clinically, especially aneurisms of the aorta, there is one type of aneurisms, those limited to one part of the circumference of the aorta which are easily diagnosed by the screen, yet clinically are mistaken for some other affection. Three cases of such nature are cited.

The first case was one which was diagnosed clinically as intercostal neuralgia. A thorough physical examination was negative, there was no history of syphilis, and no disturbances in respiration or swallowing were complained of. Yet on radioscopy a large aneurism of the arch and of the descending aorta was revealed. The left border of the aneurismal sac was found projecting by three fingers' breadth from the left heart border. No pulsations were observed. The patient died a few weeks later from a severe hemorrhage, and the radioscopic findings were confirmed on autopsy.

The second case was referred to the author for an examination of the stomach because of hematemesis and pain in the epigastrium. Carcinoma of the stomach was suspected. No history of syphilis, negative Wassermann, negative cardiorespiratory anamnesis and examination. A radioscopic examination showed a large fusiform aneurism of the thoracic aorta. A communication of the aneurism with the esophagus explains the hematemesis.

The third case was that of a woman of thirty-eight, suffering severe pains in the dorsal region of the back. On account of tenderness to pressure on several of the spinous processes the case was diagnosed as Pott's disease. Physical examination and history were otherwise negative. A radioscopic examination revealed a definite aneurism of the arch of the aorta.

A. M. P.

X-Ray Treatment of Actinomycosis. Steinkamm. Strahlenther., Vol. XII, No. 2, Abst. Zentralbl. f. Inner. Mediz., 1921, No. 50, p. 966.

IN three cases the author could not prevent the advancement of the disease by the usual treatment with potassium iodide, salvarsan, and operative measures. After the first irradiation there appeared a local reaction, and after repeated irradiations healing began. The boardlike hard swelling decreased and open wounds and fistulae became closed. The author used a spark gap of six.

A. M. P.

Opaque Solution for Pyelography. D. Van Capellen. Nederl. Tijdsch. v. Genesek., 1921, II, p. 1138-40 Abst. Zentralbl. f. Inn. Mediz., 1921, No. 50, p. 974.

INSTEAD of the solution of sodium bromide the author prepares for his pyelographic work one of sodium iodide. While the sodium bromide is of twenty-five per cent strength and has an osmotic pressure of 13.47 the author's sodium iodide solution is only 13.5 per cent strength and has an osmotic pressure of 3.78 corresponding to the pressure of slightly concentrated urine, almost isotonic. The shadow cast by that solution is by no means inferior to that cast by the bromide or collargol solutions, while the reaction on the part of the patient is insignificant.

A. M. P.

Roentgen Treatment of Trigeminal Neuralgia. E. Pavr. Muench. Med. W. 1921, No. 33, p. 1041.

IN a lengthy discussion of the diagnosis and treatment of trigeminal neuralgia, in which he advises an x-ray examination for misplaced teeth, bone changes, and foreign bodies, the author has the following to say regarding the x-ray treatment of the disease:

"Deep x-ray therapy gives splendid results in cases previously untreated surgically, that is, where no alcohol injection, nor any peripheral extraction were attempted. To our great regret a large number of cases had had such treatment before the roentgen therapy was applied, a fact which is responsible for the reports of failures."

"The roentgen treatment must precede alcohol injection or peripheral extraction. Otherwise, as has been reported by Lenk, and as I had many an opportunity to confirm, the surrounding scar tissue prevents the proper action of the rays on the nerve trunk. It corresponds exactly to the treatment of root pains in metastatic carcinoma of the vertebrae."

A. M. P.

Renal Pneumoradiography. Dr. Paul Rosenstein. Zeitsch. f. Urol., Vol. XV., 1921, No. 11, p. 447.

BY the above term the author designates his procedure of making an extraperitoneal inflation of a small amount of oxygen about the kidney, thus enabling it to be studied at greater detail roentgenologically.

After reviewing the history of air injections for diagnostic purposes the author discusses the technique and purposes of his own newest procedure.

The patient lies on the side opposite the kidney to be examined. After proper aseptic precautions are taken and a local anaesthetic is applied, a needle is inserted about five cm. lateral to the first lumbar vertebra. The direction of the needle is slightly medial and upward, and allowed to enter five to six cm. deep, the operator will usually notice that the needle has pierced the musculature and fascia. If blood appears the position should be changed. It is then connected to a bulb and the gas, about one-half to one liter, is inflated under water.

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The kidney with a gas mantle around it stands out very distinctly under the screen or on the radiograph. Changes in size, contour, and position, are very easily noted, and by turning the patient the whole kidney is examined. Stones stand out in clear relief.

This method does not come to displace older methods, but to be used there where other methods cannot be applied, where cystoscopy cannot be performed.

Renal pneumoradiography affords information on neighboring intraperitoneal organs as well. Even six hundred cc. will be sufficient to raise the diaphragm and give a very distinct outline of the spleen. right sided examination gives valuable information on the gallbladder and liver.

A number of interesting renal pneumoradiograms accompany the paper.

A. M. P.

X-Ray Dermatitis. By Mary L. H. Arnold Snow, M. D. Medical Record, Dec. 3, 1921, p. 981. (Continued from Nov. 26).

THE abstract of Dr. Snow's first paper on this subject was published in the February number of The Journal.

Chronic dermatitis is found chiefly among x-ray operators and is usually the result of a series of exposures. In the less pronounced forms the skin appears chapped and rough, the normal markings destroyed and the folds of the skin at the knuckles are swollen and stiff. It is characterized by hyperkeratosis and telangiectasis may also be present. If of a fourth degree dermatitis the condition may last for years.

An erythema dose requires only suspension of x-ray treatment until it has subsided. In the second, third, and fourth degrees of dermatitis recourse is had to radiant light and heat from a carbon filament lamp and to ultra-violet rays and radium.

The author has made use of radiant light and heat, ultra-violet rays and the gamma rays of radium and considers them all valuable agents in the treatment of x-ray dermatitis. Radium is limited to the treatment of keratoses.

These agents not only inhibit the degenerative process, but they institute regenerative processes and have a systemic effect which raises the patient's resistive powers.

The chemical reactions resulting from the use of these remedial agents is discussed at length, also the technique for their application.

The Technique of Radium Treatment of Carcinoma of the Prostate and Seminal Vesicles. Hugh H. Young, M. D. Baltimore. Surgery, Gynecology and Obstetrics, January, 1922, p. 93.

PASTEAU and Degrais in 1913 presented a method of treatment of carcinoma of the prostate with radium which was introduced into a catheter by means of a long wire attached to a silver tube containing radium. The catheter was introduced into the urethra and left in place for an appropriate length of time.

Since then improved devices have been worked out by means of which radium is introduced through the rectum, urethra, at the vesical neck or through the trigone and base of the bladder to the region of the seminal vesicles.

In a preliminary study a diagram showing the size and consistence of the prostate is made. This is done by means of a diagram of a normal prostate and a rectal examination from which alterations on the chart are then made.

A cytoscopic examination is not made if the x-ray examination shows extreme induration of a portion of the prostate and an

absence of calculus, but if this examination does not result in a clear diagnosis then cystoscopy is performed.

The majority of cases present themselves much too late for radical operation, the disease having progressed well up along the sides of the seminal vesicles and frequently having involved the lower pelvic glands.

Care is exercised to avoid application of radium twice in the same place. The radium is placed in position with the finger in the rectum and is then held in place by means of a cystoscopic clamp. Burns and even pronounced irritation have been entirely eliminated so that it is now possible to give with impunity twenty treatments of one hour each with one hundred milligrams properly screened.

With the introduction of Barringer's needles two of these were employed at a treatment with each needles containing twelve and one-half milligrams. These are inserted through the skin of the perineum (cocanized) into one or both prostatic lobes or even into the carcinomatous mass above the prostatic lobes, or along the lateral wall of the pelvis in the region of the seminal vesicles. These needles are left in place from eighteen to twenty-four hours.

As given at present the treatment consists of one complete series of hourly treatments of one hundred milligrams of radium properly screened and applied with a special applicator alternately twenty times through the rectum, ten times through the urethra, and ten times through the trigone. Twelve and one-half milligrams are given eight times through the perineum. Ulceration is not produced because these regions provide sufficient areas which do not overlap. A recently constructed applicator has shortened the above treatment, as two hundred milligram hours can be given each hour.

With such treatment most cases show an amazing resorption of extreme carcinomatous involvement of the prostate and seminal vesicles and tissue adjacent to them. Disappearance of pain and obstruction, a return to more normal urination and freedom from straining is also secured.

Before treatment the patient should empty the bladder and evacuate the bowels. No anesthesia is necessary for treatment through the rectum, but for treatment through the urethra and bladder four per cent procaine is first injected, and in more painful cases one-sixth grain morphia or opium suppository is given one-half hour before treatment. Sometimes treatment can be given twice a day, but usually only once. Alternation is usually between the urethra, rectum and bladder, picking each time a region not treated previously. A record is kept upon charts and a line drawn each time showing exactly where the radium was applied and the date is indicated on the line pointing to the site of application. Treatments through the perineum are similarly charted.

In a certain proportion of cases, probably ten per cent, obstruction persists and the presence of residual urine and frequency of urination necessitates operative removal of the obstruction, but before prostatectomy the patient is given as thorough a radium treatment as possible through the rectum, urethra, and bladder, and in most cases the obstruction disappears, but if operation is performed a conservative perineal prostatectomy with enucleation of the obstructing medium and lateral lobes and careful preservation of the urethra and ejaculatory ducts is carried out.

Remarkable results have been obtained, but the period of time elapsing is too short as yet to give an opinion as to cure, but palliation and lengthened life have at least been secured.

In a paper by Clyde Deming, M. D., Baltimore, published in the same number of Surgery, Gynecology and Obstetrics, Dr. Deming, who is a co-worker with Dr. Young in the Brady Urological Institute of Johns Hopkins Hospital, gives the results of one hundred cases of cancer of the prostate and seminal vesicles treated with radium.

Dr. Deming's conclusions are:

1. Radium gives symptomatic relief and a return to normal urination in seventy-five per cent of these cases.

2. Relieved pain in the back in fifty per cent of the cases suffering with metastases.

3. Irritation from radium can be avoided.

4. At least one thousand milligram hours must be given to produce symptomatic improvement.

5. At least fourteen hundred milligram hours must be given to produce any perceptible change in the tumor mass.

6. At least three thousand milligram hours must be given to produce symptomatic and local results.

7. Four thousand to five thousand milligram hours should be given within a period of six to eight weeks if possible in addition to needle treatments of five hundred to two thousand milligram hours through the perineum.

8. Cases which did not respond to radium did not have sufficient treatment.

9. Large doses must be given in as short a period as possible to produce maximum results.

10. No general systemic reaction has been encountered.

11. Combined extra-glandular and intra-glandular radiations apparently give the most satisfactory results.

12. Thus far there is no actual proof that radium has produced an actual cure for carcinoma of the prostate and seminal vesicles although three cases remained free from symptoms and tumor growth for more than four years and many others upon a rectal examination show a condition of the prostate which does not resemble cancer.

The conclusions reached in a series of thirty-three operative cases are as follows:

1. A combination of radium and surgery offers a possibility for treatment of cancer of the prostate and seminal vesicles.

2. Operation does not diminish the amount of radium necessary to produce good results.

3. Operation does not increase the possibility of hastening metastases.

4. The histological picture is variable.

5. Radium does not act alike in all cancer tissue.

6. Radium has two distinct activities: there is an area of gradual cell destruction and another of necrosis.

7. There are three kinds of cancer of the prostate: (1) scirrhus, (2) adeno-carcinoma, (3) cellular or medullary.

X-Ray Study of Five Hundred Medical Cases for Paranasal Sinus Infection. Rex L. Dively, M. D., St. Joseph, Mo. J. Missouri M. A., January, 1922, p. 21.

THE author quotes from an eminent laryngologist his theory of the causation of sinusitis, which is as follows: "Swelling of the mucous membrane within the nose quite frequently occludes the natural openings. The occlusion is soon followed by an absorption of the contained air, thus creating a vacuum. This leads to transudation of serous fluid into these cavities, as we often find in the middle ear. This fluid soon forms a favorable medium for the development of pathogenic bacteria." The author believes that sinusitis is more often caused by the encroachment of a deviated septum on the normal drainage of the paranasal cells,

Five hundred consecutive cases were studied each receiving a thorough physical and laboratory test as well as a roentgenological examination. The basis upon which they were referred was that of frequent colds, chronic colds, nasal discharge, morning headache, history of nasal operation, deviated septum, obstruction of breathing, pain over the sinuses, nasal deformity, crust formation or dry mucous membranes.

In most cases the examination was made with one plate taken in the forehead-nose or Caldwell position. In doubtful cases the patient was subjected to anterior-posterior stereoscopic and latent plates.

The object of the study was to ascertain the percentage of patients in a private consulting practice who showed roentgen evidence of a sinus infection. Many of the patients showing positive roentgen findings of sinusitis gave surprisingly little clinical evidence of it even though under the treatment of a competent laryngologist. In a large percentage of these cases the roentgen findings were proven clinically or by operation.

The study gave the following data:

Number of cases referred for x-ray study, five hundred.

Negative x-ray findings, three hundred and sixty-one.

Some form of positive x-ray findings, one hundred and thirty-nine.

These one hundred and thirty-nine cases are further classified in the original paper.

The history of a number of cases who roentgenologically gave plus symptoms of sinusitis gave sixty-nine per cent with a direct or indirect history of sinus trouble. Examination and history gave twenty-nine per cent diagnosed and forty-eight per cent with strong clinical evidence.

The author's conclusions are:

1. That a roentgen examination of the nasal accessory sinuses should be made in every case of suspected focal infection which gives a history of any of the pathological conditions mentioned in the second paragraph above.

2. Many obscure cases can be diagnosed by the x-ray which would escape notice in clinical examination.

3. Some cases found by the x-ray and not possible to prove clinically give wonderful results upon treatment or after operation.

4. About twenty-seven per cent of patients seen in a private consulting practice have or have had some form of sinus infection.

5. Approximately six per cent of these patients thus seen have an active sinus infection.

Ultra Violet Ray Therapy—Its Application in Nose, Throat and Mouth Affections. Leo C. Donnelly, M. D., Detroit, Mich. J. Michigan M. S., Jan., 1922, p. 23.

THE author has administered in the neighborhood of seven thousand ultra violet ray treatments, and from the experience and data thus obtained submits the following:

Ultra violet rays sterilize infected tissues. Laboratory experiments have proved that the rays destroy germs and also that the red blood cells absorb and conduct the rays to different parts of the body.

"Toxins are broken down in the same way that germs are destroyed, and it is a safe assumption that, after absorption and transmission, as aforesaid, the tendency of the rays and reactions therefrom show:

"Hemoglobin is increased.

"White blood cell content is normalized.

"Blood and lymph flow are both increased.

"Congestion is certainly relieved, cellular tissue is nourished, and elimination of waste products greatly accelerated.

"There is a direct action on the nervous system."

Acute colds may be prevented and chronic colds immediately benefited by ultra violet ray therapy. If treatment is persisted in complete relief results. A very large percentage of cases of chest involvement (pleurisy, whether tubercular or pneumonic, and in empyema show relief from pain.

Nasal and throat diphtheria carriers are rendered non-infectious in practically one hundred per cent of cases. In mumps the use of the rays by the author has removed the pain to a marked degree and shortened the duration of the disease. Several cases of osteomyelitis of the jaws have been apparently cured.

Apical abscesses, tooth infections, pyorrhea and kindred mouth infections have been benefited by ultra violet ray treatment. Sterilization of the gums previous to extraction and of the socket after extraction greatly reduces the soreness usually consequent upon these procedures.

In acute sinus infections treatment brings relief of headache, thinning of the pus, and normal ventilation of the sinus with apparent cure. In chronic sinusitis more treatments are required, but permanent benefit is secured.

Acute tonsillitis may be aborted and in any case the duration and severity lessened by ultra violet ray treatment, which will destroy the toxins thrown into the system. The size of hypertrophied tonsils can be reduced—in some cases further treatment by x-ray is, however, required. When operation is necessary pre-operative treatment is an aid. In enlarged cervical lymph glands and tubercular glands the treatment is also recommended, though in some cases x-ray or curetting may be necessary.

In hay fever there is occasionally an apparent cure and frequent benefit from treatment. More perfect control is looked for. In atrophic rhinitis very satisfactory results have been obtained though not complete cures. The changes in metabolism bring about the results in these cases.

In conclusion the author states that the intelligent application of ultra violet rays in general nose and throat infections is always warranted, and through the action of the rays on the blood and cellular tissue a normal local metabolism is established.

Enzyme Mobilization by Means of Roentgen Ray Stimulation. William F. Petersen, M. D., and Clarence Saehof, M. D., University of Illinois College of Medicine. Am. J. M. Sc., January, 1922, p. 101.

IT is at present a recognized principle in the therapeutic application of photodynamic and radiant agents, including roentgen rays, radium, Finsen and red rays, sunlight, etc., that apart from the direct effect on the exposed tissue, these agents may bring about a distinct systemic alteration.

Musser and Edsall, in studying the effect of roentgen rays on the metabolism of leukemic patients surmised that an acceleration of the proteolytic activity resulted from the roentgen ray treatment. It may be permissible to quote at length from their interesting paper. "The facts that have just been mentioned demonstrated, we think, that the effect of the roentgen rays is not a direct one, but one that requires response on the part of the individual. To be made specific concerning the processes that are stimulated and accelerated by the roentgen rays, we consider that it is highly probable that the action is chiefly on autolysis. A considerable number of physiological and pathological processes have, with considerable probability, been shown to be due to autolysis, that is, to activities that have the characteristics of ferment-like pro-

cesses and that produce in their course the same classes of substances as those found in the various stages of digestion. The view is now widely accepted that the exudate in pneumonia undergoes resolutions as a result of sudden autoindigestion, carried out not through bacterial influences, but through the activities of the tissues. Following the general trend of thought and the direction in which the results of recent experimental work pretty generally point, the most natural explanation of the increase in tissue destruction, when this destruction is dependent upon individual body reaction, is that it is due to acceleration of autodigestive or autolytic processes. The remarkable suddenness and intensity with which the action of the roentgen rays begins immediately after exposure is more direct evidence in favor of the view that autolysis is influenced."

In a second contribution (Edsall and Pemberton) the effect of roentgen rays on unresolved pneumonia was studied as well as attention directed to possible toxic results that might be related to the effects of the roentgen rays. In these two papers the very definite foundation for the therapeutic application of the rays in stimulation of enzyme activity, thereby influencing pathological processes, was formulated.

Considering the fact that the enzyme mechanism very probably plays a role in such pathological conditions as pneumonia and tuberculosis infection, and that even in the non-specific reaction the effect of enzyme mobilization is supposed to be of some importance, we thought it might be of interest to study whether by means of the roentgen ray or other similar agents we could bring about the "shedding" of organ enzymes.

Apart from the mobilization of enzymes the selective stimulation of organs by means of the roentgen ray or related agents is a related field in which therapeutic applications have been reported only in very recent papers. These include the alteration in the coagulation mechanism following raying of the spleen and the effort to increase the function of certain of the glands of internal secretion by means of stimulating doses.

Preliminary experiments were carried out to determine whether variation in enzyme titers occurred in the serum following roentgen ray exposure of the liver, intestinal and splenic area. These experiments were carried out on the dog and from them data were secured on the following points: temperature changes, leukocyte counts, differential count, blood coagulation, nitrogen excretion, and enzyme titer.

The conclusions drawn by the authors are quoted below:

1. By means of selective organ stimulation by roentgen rays in moderate dosage it seems possible to influence the serum enzymes to a considerable degree. Such doses act in stimulating a mobilization of various enzymes; large doses lessen the titer of the serum enzymes.

2. Raying the hepatic area in dogs resulted in a temporary leukocytosis (with eosinophilia) as well as a well defined increase in the titer of protease, peptidase, lipase and diastase in the serum.

3. Raying the intestinal area resulted in a more persistent leukocytosis and a marked mobilization of peptidase; the other enzymes were altered less in proportion.

4. Raying of the splenic area was followed in general by a diminution of the serum enzymes with the exception of he lipase.

5. Alteration in the coagulation time of the blood following raying was not confined to raying of the splenic area, but followed exposure of the other regions as well. No

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alterations of complement titer were observed following organ stimulation. The antiferment was usually increased after periods of raying.

Progress and Promise in the New X-Ray Treatment of Cancer. James T. Case, M. D., Battle Creek, Michigan. *J. Michigan M. S.*, January, 1922, p. 28.

THE success attendant upon radium therapy led to recognition of the importance of securing more penetrating x-rays, for the gamma rays of radium have a shorter wave length, and are therefore much more penetrating than the shortest wave length x-rays produced up to the time radium was generally accepted for the treatment of deep cancerous growths.

The first voltage used was scarcely four thousand volts, by 1910 a voltage of seventy to eighty thousand was employed; and with the Coolidge tube in 1913 this was raised to one hundred and twenty-five thousand volts. Now, with the very latest of the Coolidge tubes a voltage of two hundred and eighty thousand is employed.

As far back as 1914 reports from Europe told of cures of deep seated cancer, especially of the breast and pelvis, through x-ray or through a combination of x-ray and radium. These reports have continued to be enlarged upon. It is true that several hundreds of hopeless cases with an expectation of only a few months of life have received palliation for a period of several years, and some have been so free from symptoms as to be pronounced cured.

The author has for almost a year now been supervising the treatment of a large number of hopelessly inoperable cases and unprecedented palliation has been experienced with these, but he considers it unfair, unscientific and unwise to make statements regarding the possibility of cure until several years have elapsed. Results, however, are at present most encouraging. Many instances are cited from the Battle Creek Sanitarium Clinic as well as from clinics abroad.

The author and Dr. Kellogg have made it a rule to precede as well as to follow all operations for malignancy with thorough irradiation.

The new treatment is producing prompt and satisfactory results in cases of hyperthyroidism, uterine hemorrhage and obstinate bone infections. Treatment of the tonsils and the prostate is bringing encouraging results.

Important points of technique must be noted. It is vital that the lethal cancer dose be administered at the first attack and within the shortest possible time. The new apparatus greatly facilitates the doing of this. There must be a follow up system with each patient to secure best results. There must be contemporary treatment by various means, mostly physiotherapeutic and dietary. Another paper is promised upon this phase of the treatment.

Benign and Malignant Gastric Ulcers from a Roentgenologic Viewpoint. Russell D. Carman, M. D., Rochester, Minnesota. *Am. J. Roentgol.*, December, 1921, p. 695.

THE benignancy or malignancy of an ulcerous lesion is not always determined by the x-ray. The distinction between typical cancer and typical ulcer is not a difficult one. A typical cancer shows a local diminution, a filling defect of the gastric chamber; while a typical ulcer shows a local expansion, a niche. One is a tumor mass intruding on the gastric lumen, the other an excavation of the gastric wall, but between the two are many gradations, though roentgenologically they must be classified as tumorous or ulcerous.

Experience has proved that most gastric tumors are carcinomatous, therefore, they are diagnosed as cancer. That any ulcer is po-

tentially a cancer is a conclusion difficult to escape, therefore surgical removal of the ulcer is the logical step to take. Only the microscope can be absolutely relied upon for diagnosis here and the roentgenological diagnosis is to some extent empirical.

Some ulcerating cancers have the gross characteristics of both ulcer and cancer. In these cases palpatory manipulation, therefore fluoroscopic examination is indispensable. Briefly summarized the visualized crater of this ulcer differs from the classic niche-type in three particulars: (1) the crater is not within the wall of the stomach and therefore does not project from the visualized lumen; (2) in profile the crater appears as a meniscus; and (3) it tends to retain its barium content during palpatory maneuvers and is not easily emptied. On the other hand the niche-type of ulcer produces virtually the same roentgenologic manifestations whether it is benign or malignant, and any prediction of its probable character based on the roentgen ray findings is hazardous.

When the niche representing the crater is two- and one-half centimeters or more in diameter cancer is usually present, though there are occasional exceptions to this.

A perforating ulcer producing an accessory pocket is seldom malignant. "An ulcerating cancer may break through the gastric wall and attach itself to adjacent tissue, but filling defects suggesting the presence of tumor are also likely to be seen.

"A marked filling defect or gross deformity of the gastric outline adjacent to a niche may suggest malignancy. Such deformities, however, are most often due to induration, perforation, adhesions, or spasm accompanying a benign ulcer."

In conclusion—"There are but two varieties of ulcerous lesions which evince any noteworthy roentgenologic indications of malignancy. One is the ulcerating cancer with the meniscus-like crater. The other is the niche-type ulcer with an unusually large crater. With these exceptions the examiner cannot venture opinions as to the probable character of ulcers revealed by the roentgen ray, nor should he be expected to do so. Any ulcer which appears to benign microscopically may prove to be malignant microscopically. Cancer may arise in an ulcer which was primarily benign."

The fifteen illustrations accompanying the original paper aid greatly in description.

A Review of Three Years Work and Articles on Pneumoperitoneum. James T. Case, M. D., Surgeon and Director Radiological Department, Battle Creek Sanitarium, Battle Creek, Mich. *The American J. Roent.*, December, 1921, p. 714.

IN his introduction Dr. Case states that he finds his position more or less embarrassing. Admitting that pneumoperitoneum marks a milestone in roentgenologic progress, being "one of the most strikingly helpful roentgenologic means perfected within five years" he asserts that it has inconveniences and dangers which must be admitted and receive serious consideration.

To aid in the study of the question Dr. Case sent out questionnaires to two hundred and twenty-three American workers. One hundred and thirty-one replied, forty-seven of whom stated that they had had no experience, sixty-three that they had had too limited an experience to warrant an expression of opinion.

The remaining twenty-one united in agreeing that aseptic conditions must be duly regarded, certain cardiac and respiratory cases must be excluded, carbon dioxide or a mixture of this and oxygen must be used with the quantity carefully estimated and slowly

injected—and that serious results follow the neglect or disregard of any one of these precautions.

A column is devoted to the discussion of the seemingly unavoidable distress caused by this method. Interstitial emphysema and overdistention it is claimed can be avoided by the use of proper technique.

The dangers from the method are said to be: interstitial puncture (three instances cited), puncture of the omental or mesenteric blood vessels (one case cited), puncture of the dilator ureter, bladder or other abdominal viscus. In connection with the latter danger death is charged in one case to an injection of oxygen into the spleen, and two cases of urinary bladder puncture are mentioned. One case of fatal peritonitis is charged, though this case, it is stated, was probably very susceptible to infection, being a case of advanced carcinoma. However, the author considers the risk of peritonitis to be considerable. One death, perhaps two, is attributed to an embolism. Superficial emphysema is classed as a distressing accident from which, however, no real harm has resulted. Rupture of malignant adhesions is mentioned by a number of twenty-one reporting, but the author does not consider this to be a serious matter. Precipitation of cardiac failure he considers a serious menace and gives a full description of one near fatality from this cause and mentions another. He states: "It is obvious that cases of inefficient myocardium, valvular heart lesion or other cardiovascular weakness should only exceptionally be subjected to this method."

Five deaths are charged and it is stated that while undoubtedly some of these are due to errors in technique, yet they have occurred in some of the foremost medical and surgical clinics of the country, and therefore, it is probable that these risks are unavoidable in pneumoperitoneum.

In regard to indications for pneumoperitoneum, Dr. Case considers it to be definitely indicated in a selected class of cases of obscure abdominal or retroperitoneal conditions, where the careful use of all other clinical means has failed. He strongly advocates the use of the Potter Bucky Diaphragm before resorting to pneumoperitoneum.

In conclusion, he states that the opinions expressed here are not original with him, but gathered from hundreds of sheets of correspondence with men of large experience, however, he states also that he is in agreement with them.

In the discussion following, Dr. Stewart says that while Dr. Case has treated the subject in a fair manner, yet it is to be feared he is distinctly surgical in his tendencies. He observes that death from newer procedures is not so readily accepted as it is from older established methods. He warns against indiscriminate use and gives suggestions on technique. Dr. Case replies to this that it is not his intention to kill the method, reiterates his statement as to its being a milestone in the path of progress and states that he himself expects to go on using it in a limited way, as he considers there is a definite field for its use.

When to Operate and When to Use Radium on Fibroids of the Uterus. George Gellhorn, M. D., St. Louis. *Jour. A. M. A.*, January 28, 1922, p. 259.

RADIODTHERAPY and surgery are competing methods in the treatment of uterine fibroids. This does not mean that there is any antagonism between the two—each of them has its definite place in the treatment of these cases. The only question is which of the two is the proper one to apply in the case under consideration. Either indiscriminate radio-

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therapy or indiscriminate surgery is against the best interests of the patient.

In general, the principle field for radiotherapy is in women over forty with fibroids not extending above the umbilicus. The ideal fibroid for radiotherapy is the one which is of uniform development, though equally good results are secured in the case of those interstitial fibroids tending to become submucous or subserous.

Patients with marked secondary anemia, with cardiac and renal disease, tuberculosis and other respiratory troubles, high blood pressure, and the excessively stout woman, in other words, the poor surgical risks, should receive radiotherapy. It is useful also for those cases opposed to surgical procedure.

The immediate effects are checking of hemorrhage and shrinkage in the size of the tumor. Most writers maintain that there is no specific effect from either the roentgen rays or radium on the cells of the fibroids, but that the effect is by way of the ovaries. The writer of this paper holds that in addition to this effect through the ovaries, there is a distinct and specific influence of the rays, and to support his theory cites facts from two cases which seem to bear him out in his opinion.

Cases must be properly selected always, as radiotherapy may be not only inefficient, but even harmful if the case has been wrongly diagnosed as fibroid.

Radium alone is superior to the roentgen ray alone, but the ray following radium treatment is often a great aid.

Radium should be inserted within the uterine cavity and remain there on an average long enough to equal twelve hundred milligram hours. Treatment should follow soon after menstruation.

The advantages are summed up as follows: sixty per cent clinical cures, no mortality in expert hands (whereas in surgery even the best records show a mortality of three to five per cent), the morbidity following treatment is insignificant, radiotherapy is less expensive than surgery and allows a quick resumption of daily activities.

Surgical treatment is indicated in all tumors extending above the umbilicus, and in all large pedunculated, subserous or submucous fibroids, for here radiotherapy might produce a necrosis of the tumor. Cervical fibroids, suppurating necrotic or gangrenous tumors and those undergoing cystic or calcareous degeneration, and fibroids complicated by ovarian tumors or tubal infection should be reserved for surgery. Unsexing may be avoided in surgery, but cannot be in radiotherapy, therefore, in women under forty surgery is the method of choice.

There is a group concerning which there is still discussion as to the method to be employed. Rapidly growing fibroids suspected of sarcomatous degeneration may be operated or receive radiotherapy, but if the latter is used the sarcoma dose must be given. Fibroids are sometimes found associated with carcinoma of the body of the uterus. In these cases the author prefers a panhysterectomy, but if asthenia or lesions of other organs exists, radiotherapy may be used. It is of vital importance to establish the presence of a corpus cancer before treatment is instituted, and this should be done by a preliminary curettage, which, indeed, should precede any intrauterine radium application, even in cases in which there is no suspicion of malignancy. If it is still desired to use the radium the customary dose of twelve hundred milligram hours should be increased to three thousand milligram hours and the treatment repeated within a few weeks.

Fibroids encroaching heavily upon the bladder or rectum and interfering with their function the author would remove as quickly as possible by surgery, but many experienced workers advise an attempt, at least, with radium or roentgen rays.

The Management of Certain Types of Malignancies. Jackson W. Landham, M. D., Atlanta, Ga. J. M. A. Georgia, January, 1922, p. 1.

RESULTS obtained by the combined use of the x-ray, radium, electro-coagulation and fulguration in connection with surgery or used alone in inoperable cases have justified these measures in the management of all types in malignancies. Both the growth and the patient must be carefully studied before deciding on the method of treatment.

Basal cell epithelioma occurs more frequently in men and is found in the nodular form, as an ulcerated area, or as a scaly lesion. Over ninety-six per cent of these are located above the clavicle. Better cosmetic effects and as high a percentage of cures as with surgery lead the author to prefer other methods than surgery in these cases.

His technique is as follows: (1) Destroy inflammatory and hypertrophied tissue by fulguration and thus close the lymphatics having a direct communication with the lesion. (2) Irradiate the lesion with the roentgen ray or radium, protecting the surrounding normal tissue by means of a sheet of lead one-sixteenth of an inch thick, which has been perforated to conform to the size of the growth to be treated, the area receiving a pure erythema dose. Two mm. of aluminum with the x-ray or five-tenths mm. of brass with radium is sufficient filtration. (3) Treat regional lymphatics with the x-ray to prevent the possibility of metastases, using deep therapy, heavy filtration and high voltage.

Epitheliomata of the mucous membrane of the mouth are highly malignant and show an early tendency to metastasize and the mortality rate is very high. Most cases referred to the radiologist are referred from the surgeon because inoperable. Fulguration, massive doses of radium and intensive x-ray therapy over the growth and the adjacent lymphatics are required.

In inoperable, post-operative and recurrent cases of carcinoma of the breast and in metastases of these cases the roentgen ray is the agent of choice. The technique used is nine and one-half inch spark gap, five milliamperes current, ten inch skin target distance and not less than six mm. aluminum as filters. The entire surface should be treated through small portals of entry, eight by ten centimeters, with nine to fifteen minutes exposure. Electro-coagulation and radium should supplement the roentgen ray treatment.

Dr. William J. Mayo is quoted as authority for the statement that post-operative and pre-operative treatment by the roentgen ray is most desirable. "By properly combining radiotherapy with surgery we can increase operability, lower mortality and increase the percentage of cures." Operation should not be delayed after radiotherapy because of the comparatively short period of increased cell vulnerability and the fact that the subsequent connective tissue formation will interfere with surgery. The author states that three weeks after ante-operative treatment is the proper time for operation.

Cancer of the cervix, when seen by the surgeon or the gynecologist, is practically always inoperable. A review of the literature shows that roentgen rays and radium are invaluable here.

In lymphosarcoma the roentgen ray is more effective than radium and preferable to surgery.

Treatment of Goiter. C. L. Hoag, M. D., San Francisco, California State J. Med., January, 1922, p. 6.

IN the treatment of goiter the pendulum has swung from medicine to surgery, and now over toward radiotherapy. The author makes the criticism that much of the treatment is carried on in a perfunctory way, without proper choice of cases and without a knowledge of the general principles essential to intelligent choice of therapeutic measures. Too many who have little experience in even general therapy are giving treatment for this malady.

Diagnosis of thyroid disease is only the first step—it is just as necessary to recognize clearly the various forms of thyroid enlargement as to distinguish between different forms of intestinal parasites.

For practical purposes the classification given below meets all requirements:

GOITER

Atoxic	1 Simple hypertrophy, adolescent goiter.
	2 Colloid, calcified or cystic.
	3 Simple adenoma.
Toxic	1 Toxic adenoma.
	2 Hyperplastic (exophthalmic).
Malignant	1 Carcinoma.
	2 Sarcoma, etc.

In well developed cases it is easy to determine the classification of the goiter, but many border line cases give only mild symptoms and a large goiter may be deficient in thyroid secretion while a barely perceptible gland often is producing an extensive degree of hyperthyroidism.

Since the thyroid secretion seems to be the principal regulator of the metabolic processes of the body an accurate estimate of its activity is secured by determining the basal metabolism in goiter patients. Many diseases influence the metabolic rate, but the influence of goiter is most striking.

In the Crile and Mayo clinics radical operation is not done in toxic cases until the basal metabolism is less than plus fifty per cent. Medical treatment, ligation of the superior thyroid arteries and x-ray are used until this point is reached, and even then the time of the operation must be determined by the phase for each indicated.

The author believes x-ray or radium therapy is indicated in simple hyperplasia and hyperplastic goiters only, and contra-indicated in colloid, cystic, nodular and adenomatous types. Treatment of goiter is essentially surgical, medical treatment. Roentgenotherapy and radiotherapy are sometimes curative and are often helpful in decreasing thyroid activity and in preparing the patient for operation.

The X-Ray Diagnosis of Gastric and Duodenal Ulcer. L. R. Hess, M. D., Hamilton, Canada. Canadian M. A. J., Dec., 1921, p. 914.

THE interpretation of x-ray findings on the screen, in terms of pathology, requires more skill, judgment and experience than almost any other diagnostic procedure. Inexperience and mistaken technique are the most fruitful sources of error in diagnosis.

Additions to or subtractions from the normal gastric or intestinal lumen, as seen on the plate or screen, form the basis of roentgenological diagnosis of gastric and duodenal ulcers.

The author's technique consists of fluoroscopic examination with barium, palpation, and a number of serial plates, two to ten, some of which may be made in oblique and some in lateral position. After five hours

another examination is made and twenty-four hours after the first examination the third examination is made.

These ulcers vary in size from that of a split pea to an area two and one-half inches or more in diameter, and are usually situated near the pylorus and nearly always are found involving the lesser curvature or the posterior wall. Loss of tissue first involves the mucosa and later spreads to the deeper layers. Scar tissue results with the ultimate deformity of the gastric wall, the demonstration of which forms the basis of differentiation between the two lesions.

A small bud-like projection from the main shadow represents the actual ulcer crater and this niche is pathognomic of penetrating gastric ulcer. The accessory pocket is demonstrated as a sac or pouch protruding from one-fourth to one inch or more inside the stomach proper, retaining its contents often after the stomach is empty and having a narrow neck or isthmus connecting with the stomach.

Other more or less indirect signs are the following: incisura (indentation of the greater curvature opposite the ulcer), hour-glass stomach, pressure tender spot and lessened mobility. Malignancy is always suspected when the ulcer crater is large.

Except for the fact that gastric ulcers are larger, more prone to scar tissue and adhesions and more likely to become malignant, there is no pathological difference between them and duodenal ulcers.

The indirect signs in duodenal ulcer are: the accessory pocket, gastric hyperperistalsis, gastric hypermotility with rapid emptying, pressure tender point, and a residue after six hours.

The value of these indirect signs is small when compared to visualizing on the screen or serial plates a fixed and constant irregularity of the duodenal bulb, which is normally a constant entity. A deformity of the duodenum may be produced by adhesions or by spasms, but these filling defects are not constant in action.

The Present Position of the Treatment of Carcinoma of the Cervix. William Fletcher Shaw, M. D. Brit. M. J., December 31, 1921, p. 1101.

WERTHEIM'S hysterectomy and the discovery of the effect of radium on the lesion has brought a greatly improved prognosis in cancer of the cervix, but results are yet far from satisfactory.

The public should be educated to realize that hemorrhage is a symptom requiring investigation, and every physician should recognize that an examination in such cases is a duty not to be delayed. Early investigation would greatly aid in results of treatment.

Under old methods of treatment cancer of the cervix was divided into two groups and a vaginal hysterectomy was performed in early cases, and in the others too far advanced for this, palliation was sought through scraping and cauterizing the cervix. With only rare exceptions recurrences were the order.

Wertheim's hysterectomy was a great advance in treatment, though with this the mortality is still very high, due largely to the fact that many cases are very far advanced before aid is sought.

Radium therapy was the next great step in the treatment of these lesions. The writer is not over-enthusiastic in regard to the present results obtainable with radium, but enthusiastic enough to predict that it will ultimately be relied upon solely in the treatment of these cases.

The Relative Value of Surgery, Radium and X-Rays in Cancer Therapy. Isaac Levin, M. D., Clinical Professor of Cancer Research, New York University and Bellevue Hospital Medical College, New York City. The Urologic and Cutaneous Review, January, 1922, p. 5.

SURGERY, radium and x-ray therapy constitute today the total of all known methods of combating cancer. Over-enthusiasm or unwarranted pessimism concerning any one form of treatment interferes with true scientific progress and is to be deplored and discouraged. To find the true evaluation of each method and perhaps a correlation of them is of the greatest import. After thirty-five years participation in the work the author states that while the cancer victim today has undeniably far greater chances of recovery than ever before, yet undue enthusiasm does only harm to his cause. In cancer therapy immediate results must always be discounted a few years later.

Surgery, while meeting with some degree of success, has not solved the cancer problem. A comparative analysis of vital statistics and cancer statistics shows that in the hands of different surgeons the highest percentage of all cancer cases of a community which can be cured by surgical treatment is 15.25 per cent and the lowest 4.15 per cent, or in all probably less than ten per cent.

From a study of the mechanism of the action of radiation in radiotherapy it is evident that radiotherapy is theoretically superior to surgery, inasmuch as it may destroy or inhibit malignant tumor tissue without injury or removal of the adjacent normal tissues. This surgery cannot do.

Much has been done by x-ray alone and much by radium alone. The advantage of radium over x-ray lies in the fact that the same local effect can be obtained by it without the general reaction so frequent and so severe in x-ray therapy.

The quotient of the depth dosage in roentgenotherapy can only be improved by the addition of the secondary and scattered radiations, which form within the tissues. The larger the portal of entry the greater the quantity of the secondary radiations, and to obtain the necessary quality in the depth a large field must be used.

The newest apparatus and methods make it possible to send a certain fairly well defined quantity of radiations into deeply seated malignant tumors. Nevertheless a great many of the deductions made by the originators of these methods are too sweeping and do not bear scientific, biological, and clinical analysis. Biological behavior of a cell cannot be translated into an arithmetical equation and certain assertions as to cure are premature.

From a clinical survey it is concluded that "though the newest methods of x-ray therapy represent great progress and must supersede all the previous methods, x-ray therapy alone is not a correct method of cancer therapy and is undoubtedly not as efficient as surgery alone or radium therapy alone."

Both radium and the x-rays exert a truly specific selective action on cancer tissue and biologically they present the nearest approach to a specific therapeutic measure. The limitations of both agents are due mainly to the size and location of the tumors. Further progress in cancer therapy must be looked for in the development of correct methods of combination of the three therapeutic measures.

Radium Technique in Treating Cancer of the Esophagus. C. W. Hanford, M. D., Consulting Radium Therapeutist, Cook County Hospital, Chicago, Ill. Jour. A. M. A., January 7, 1922, p. 10.

IN cancer of the esophagus the fluoroscope will show stricture if this exists, but tells nothing as to the thickness of the walls and very little as to the extent of the lesion upward and downward. Judging from necropsies the author believes the lesion usually extends from one to two inches, though some may possibly extend farther. The varying thickness of the wall of the canal adds difficulties.

However, with only the fluoroscope, dilators and the esophagoscope as aids in radiotherapy of this disease, good results are being accomplished in a number of cases. The canal can be kept open and a gastrostomy avoided.

There are five requisites for the proper emplacement of radium in the esophagus, namely: A knowledge of the location and physical peculiarities of the tumor and the resulting stricture, especially as to location, extent and direction of stenosis; a means of effective and non-traumatizing canalization of the cancerous stricture; a mechanical means of maintaining the radium in direct contact with the tumor; a ready means of frequent observation as to the position of the radium during the period of the treatment; and lastly a careful selection as to dose, filtration and frequency of treatment.

The location of the malignancy may be determined by (a) the fluoroscope after bismuth or barium, (b) sounding with olivary bodies, and (c) esophagoscopy. Sometimes all three must be used, though the author does not favor the esophagoscopy.

The ingenious device of Sippy, made of silk thread, wire and olivary bodies is used to accomplish canalization and there are several ways of maintaining the radium in contact with the tumor, one of which is described.

A roentgenogram, taken after the carrier is in position, and fluoroscopic examination, using fluid bismuth, is made six hours after the carrier has been placed.

The author bases his dosage upon empiricism, fifty milligrams being selected with an exposure from eight to ten hours. Starting at the lower end of the canal the radium is raised at the end of eight hours to the next area.

The results are not all that can be hoped for, but they are of value. Out of fifteen cases the author has seeming cures in four, and all patients were benefited. Dysphagia was relieved and pain kept at bay for a time. Subsequent treatment helps in many cases, and this treatment the author gives in from three to four weeks after the first.

In conclusion, the author states that since there is a percentage of cures in a disease formerly always fatal, and since life is prolonged and palliation secured in the majority of cases without gastrostomy, the radiotherapy of this type of malignancy is invaluable.

Pathological Classification of Thyroid Gland Diseases with Radium Treatment in Toxic Goiter. R. E. Loucks, M. D., Detroit, Michigan. Am. J. Roentgenol, December, 1921, p. 754.

DISEASES of certain glands or organs must be classified accurately as to the pathological condition present; whether it is acute, subacute, or chronic is important.

In diseases of the thyroid there are three important general classifications with subgroups of each. They are:

1. Inflammations—
 - (a) Acute purulent thyroiditis (rare).
 - (b) Tuberculosis of the thyroid.
 - (c) Diffuse interstitial thyroiditis.
 - (d) Interstitial thyroiditis as in pellagra.
2. Tumors—
 - (a) Carcinoma.
 - (b) Carcinoma sarcomatodes.

- (c) Sarcoma.
3. Dystrophies—
 - (a) Colloid retention hyperplasia.
 1. Colloid goiter (diffuse).
 2. Circumscribed colloid adenomata (cystic).
 - (b) Proliferating type.
 1. Adenoma.
 2. Fetal adenoma.
 3. Adenoma with toxic changes.
 4. Primary exophthalmic goiter as a selective type.

For clinical classification of hypo- and hyperthyroidism the following from Plummer is given:

1. Hypothyroidism—
 - (a) Cretinism.
 - (b) Myxedema.
2. Hyperthyroidism—
 - (a) Thyrotoxic adenoma.
 - (b) Exophthalmic goiter.
3. Non-toxic enlargements—
 - (a) Adenomas—non-toxic
 - (b) Adolescent goiter.
 - (c) Colloid goiter.

Toxic adenoma produces no sudden exacerbation and the sequence of symptoms is different from the exophthalmic in type. The development of the disease is gradual and the symptoms cumulative.

In exophthalmic goiter there may or may not be enlargement, toxic symptoms are mild until about the eighth month, when what is called the crisis occurs; there follows improvement with fairly constant symptoms until the end of the second year, when a secondary crisis occurs, after which there may be rapid degeneration and death or prolonged invalidism.

Note is made of the relation between oxygen intake and hyperactivity of the thyroid and the basal metabolism test is explained. Probably more than ninety per cent of the cases showing an increase in the rate of metabolism are due to hyperthyroidism.

Fear, shock, and violent emotions may precipitate hyperactivity, and focal infections from the tonsils, adenoids, duodenal and typhoid ulcers are apparent causes. Gastric disturbances, general ptosis of the abdominal viscera, also hypo and hyperactivity of other endocrines at the time of puberty, pregnancy, and the menopause are associated with it.

The symptoms are: a florid blotchy skin, tachycardia without organic heart disease, profuse sweating of the palms of the hands and soles of the feet, longitudinal striae of the nails, a choking or aching pain above the sterno-clavicular articulation, bulging eyes for two or more years, pale, muddy complexion, edema of the extremities, pulse rate of one hundred and forty with irregularity, high blood pressure, emaciation with a history of rapid loss of weight, strong apex impact with pulsation of the intercostal muscles over the heart, cardiac dullness increased with the accentuation of last sound or both sounds of the heart, apex beat one hundred and eighty with one hundred and twenty recorded at radial artery, urinary symptoms of a failing heart muscle, high basal metabolic rate, persistent diarrhea, cerebral symptoms and the presence of acidosis, a positive Wassermann.

In beginning treatment, unless diarrhea is present, saline elimination is suggested. Rest in bed, non-protein diet, ice bag over thyroid gland and precordia, alkalines internally and alkaline sponge baths are employed. Strontium bromide may be tried, quinine, hydrobromide, ergot, ergotine and sodium cacodylate. If after two weeks there are still decided evidences of thyroid toxemia the decision between surgery, x-ray and radium must be made.

The author believes radium is the treatment of choice, as results are more promising than with x-ray, and it is portable, less exciting, more easily controlled and does not pro-

duce a sudden toxemia. Atkins of Toronto, Canada, is cited for a report of one hundred cases so treated with wonderful results.

The histories of five cases of the author are given at length, and the following conclusions are drawn:

1. Where the degeneration of the heart and kidneys has not become permanent the systolic blood pressure is lowered in those cases with high blood pressure.
2. The blood pressure is raised in those where compensation is re-established.
3. In those with a metabolic rate around eighty, it was lowered for the first two weeks, raised for the third and fourth weeks, and then gradually decreased for the next few months.
4. In those with a metabolic rate above one hundred, with broken compensation, it gradually decreased after the third week.
5. In many very active cases the metabolic rate was found to be normal after three months.
6. Metabolism being the standard of toxic activity, the rate of measurement will verify clinical findings, prove results of treatment and show a physiological indication for future measures.

The discussion by Drs. W. H. B. Aikens, George E. Pfahler, and Albert Soiland bore out Dr. Loucks in all which had been given above though Dr. Pfahler expressed himself as being cautiously fearful of using too much radium upon first application and afraid to use two hundred milligrams on one side and then on the other, as Dr. Loucks had done. Also Dr. Pfahler emphasized the importance of getting rid of focal infection, mentioning the teeth, sinuses, gallbladder and appendix particularly.

The Treatment of Cancer of the Rectum by Radium. Douglas Quick, M. D., New York City. Am. J. Roentgenol, December, 1921, p. 746.

THE statistics of work accomplished during the last few years are not yet of real value, since enough time has not elapsed to judge of final results and also because the technique is changing and improving so rapidly that nothing final is yet established. Experience is encouraging, however.

In regard to surgery it may be said that a fair resume of its statistics gives the following results: "At least thirty per cent of the cases are inoperable when first seen by the surgeon. Of the operable group the immediate mortality is about sixteen per cent. The cases found clinically free from disease at the end of a three year period average below twenty per cent, although a few selected groups average over thirty per cent. An average of fourteen per cent of all cases coming to the surgeon are free from disease at the end of three years, and we know, of course, that this rate is lower each succeeding year."

The response of adeno-carcinoma and of epidermoid carcinoma to radium has been studied in other parts of the body, and since most rectal malignancies are of the one type or the other we can say from this knowledge that the rectal treatment with radium is a problem of technique.

To give an idea of what may reasonably be expected in rectal treatment, a review of the work accomplished during the past four years in the Memorial Hospital is given.

One hundred and sixty-one cases were treated—practically all very far advanced. Dr. Quick expresses the opinion that about forty per cent of these would have been better off had they not received treatment, as there comes a time in the course of malignancy when physical agents are of no avail.

A large number have been benefited from

one to three years; others are still improving and hope of complete regression is held out to some. By improvement is meant inhibition of growth, decreased size in some cases, with fibrosis resulting in a localized growth. Decreased size is followed by relief from constipation. Bleeding and discharge of mucous are alleviated and pain is very much decreased. Septic absorption is lessened and consequently there is a gain in weight and strength and a general feeling of well being. A few patients are enabled to again take up their daily work.

The bulk of infiltrating growth low down in the rectum frequently involving the sphincter gave trouble until buried emanation and surface radiatio n followed by local excision was adopted with encouraging results.

An exploratory laparotomy is felt to be justifiable in cases where the local growth presents possibilities of complete regression following the use of radium. This conclusion was reached by way of the many cases which after a short period of improvement then presented distant metastases. Metastases are found in a surprising number of cases when the primary lesion is small and the condition not suspected. A laparotomy saves many of these patients a needless amount of suffering from the after effects of what in their case would be worse than useless treatment.

A colostomy is considered very objectionable and is advised only when the application of radium is facilitated thereby and when the opening can be closed later on.

The writer has gradually changed his technique from applying filtered radium internally only to a combination of buried emanation, filtered radium internally and externally, and if necessary, surgical exposure to make the application.

Irritation of the normal rectal mucosa has added to the difficulty of treating rectal cancer.

In 1917 the use of interstitial radium emanation brought about very marked improvement in results, for both beta and gamma radiation can be used and the radiation can be distributed throughout the growth and left there for continuous radiation for a few weeks if necessary. The tubes may be inserted without anesthesia, but short gas and oxygen anesthesia is favored by the author.

At first with the use of buried emanation the internal use of filtered radium was largely discontinued, but this was found to be a mistake and its use resumed.

Rectal carcinoma must not only be treated from within, but from every available angle. Radium packs are made use of in following out this principle of treatment and results obtained are justifying it.

In conclusion—though the classification given below is vague and will be changed with changing technique, some system must be adhered to in formulating a plan of treatment. There are three groups. Group one includes all cases for whom a reasonable hope for complete regression can be entertained. In this group radium in largest possible doses through all available channels is necessary. An external laparotomy is advisable in most of these cases. With these hopeful cases the attendant discomfort of treatment must not deter one from its administration. In certain cases, especially in bulky growths involving the small sphincter surgery may be employed. A temporary colostomy may be necessary for a few.

Group two includes those advanced cases for whom a reasonable hope of palliation exists. With these patients their comfort is the first consideration. Discharge, bleeding, pain and obstruction can often be relieved by surface application, but this should not be pushed to the point of discomfort, and buried

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emanation with these patients is rarely warranted. A colostomy may be a necessity, but the decision should rest with the patient after all facts have been made known to him.

Hopelessly advanced cases for whom the physical agents hold out no chance of relief, constitute those in the third group. For them hygienic measures and medical relief are the only resource, though occasionally a colostomy may be of some benefit. It is hoped that medical education and improved technique will bring a decrease in the number found in this class, but its entire disappearance is too much to hope for.

In the discussion of this paper by Drs. Pancoast, Pfahler, Bowing, Loucks and Quick, early diagnosis, exploratory laparotomy, electro-coagulation, after-treatment and diet were emphasized as important aids in handling rectal malignancy.

Intensive X-Ray Therapy as Seen Practiced in the Clinics of Europe. Samuel Stern, M. D., Radiotherapist to Mr. Sinai Hospital, New York City. *Am. J. Roent.*, December, 1921, p. 741.

THE author gives a resume of his impressions gained during a recent visit to various clinics in Germany.

He finds great differences of opinion—in fact, unanimity exists on but two essentials of intensive x-ray therapy, namely; the necessity of an apparatus to deliver at least two hundred thousand volts and the employment of heavy filters.

Descriptions are given of the technique used at Frankfurt Frauen Clinic for mammary carcinoma, uterine carcinoma, myomas, sarcoma of the uterus, rectal carcinomas, carcinoma of the vulva, and of the bladder; at Freiburg Department of Internal Medicine the technique for pulmonary tuberculosis and Basedow's Disease; at Freiburg Surgical Clinic the technique for fractures, tuberculosis of the bones and joints, late rachitis and prophylactic treatment.

As stated, the difference of opinion is very great, the most serious difference being as to when an erythema dose may be repeated, the variation being from one month to six months.

Operations on all cases of breast and uterine cases is practically discontinued and all workers are emphatic on the non-surgical treatment of any type of sarcoma. In other malignant growths, however, the results are not so satisfactory.

The tubes in general use at present are either the Suderahre or the Coolidge type of tube, with an occasional Lilienfeld tube. None of them will stand more than a two and one-half ma. at two hundred kv. and are rarely pushed to more than two and two-tenths ma. For the past two months (Sept., 1921), they have been making tubes of the Coolidge type that will stand four ma., but these as yet have not been properly tested out for durability. Dr. Coolidge here is trying out a tube which will carry eight ma. at two hundred kv.

In a number of clinics they are even now installing machines capable of delivering up to three hundred kv. and are merely waiting for tubes to be perfected.

As an example of cases seen, one is cited who had been treated four years previously for inoperable carcinoma of the uterus, involving the fundus and both parametrium, with deep seated pelvic and inguinal glands. The uterus is at the present time freely movable with no sign of any thickening in any part of the pelvis. The patient has gained fifty pounds and looks the picture of health.

Roentgenological Studies of the Injected Kidneys. W. K. Lim, M. D., Dept. of Research, Jefferson Clinic, Detroit, Mich. *Am. J. Roentgenol.*, Dec., 1921, p. 704.

A BRIEF and very logical review of the main points in the embryology and anatomy of the nephridial system is first given.

The specimens used for this roentgen study were freshly removed kidneys of adults, children, and feti from autopsy and surgical cases; freshly removed kidneys of animals, which as far as could be ascertained, were normal; kidneys injected *in situ* soon after death; pathological kidneys injected before and after surgical intervention. There were fifty-five kidney specimens taken from these four sets; illustrations and descriptions of two of each of these sets are given.

The conclusions reached from the study so far are: First, that work upon the normal kidneys of adults, infants and feti reveals that there is always a dissimilarity in capacity, size and shape of the pelvis and the number of the calyces, not only between two different individuals, but also between the two kidneys from the same subject. Second, that the super-imposition of the shadow of one or more calyces upon the other portion of the calyces and pelvis will throw a shadow which will often resemble a stone in the pelvis. Again, if the cup-like terminal depression of the minor calyx happens to be a very deep one, it will produce a ring-like shadow of less density than the main shadow and this may be mistaken for a renal calculus. Very frequently, also, the main renal vessels cross the upper portion of the pelvis, the isthmus of the major calyx and the minor calyx. The crossing of these vessels especially if they are in a state of distention will bring about a distorted and abnormal shadow, isolating either the minor and major calyx from the main body of the pelvis or producing a partial obliteration or constriction of the isthmus.

A description is given of the preparation and injection of the specimens for study and also the essential points for roentgenographing the specimens.

Unexplained Constitutional Symptoms Caused by a Foreign Body in the Tissues. Max J. Schroeder, M. D., New York. *Medical Record*, January 14, 1922, p. 63.

THIS is a case history of a child fifteen months old who swallowed several safety pins linked together. Repeated gastro-intestinal roentgenograms failed to reveal the presence of any foreign body and finally the child was dismissed without diagnosis.

From that time on the child, who had formerly always been healthy and rosy, grew sleepless, appetite failed, an obnoxious breath developed, and about fourteen months from the time the pins had been swallowed she became sick and the physician called pronounced it to be a case of anterior poliomyelitis.

A short time after this child came under the care of the author, and upon the examination of the oral cavity a slight elevation of the posterior wall of the pharynx a little above the natural position of the soft palate was noted. Upon closer scrutiny a glistening object was noticed, and upon incision of the elevation three medium sized safety pins, rusty and greenish in color were withdrawn and followed by a rush of greenish colored pus. The cavity was given the ordinary care and healed within about three weeks and the child became once more normal in appearance and health.

The point is made that while the pins may have been swallowed in the first case, that they later, perhaps in vomiting, were lodged in the pharynx and that in all cases

of search for foreign bodies supposedly swallowed it is necessary to x-ray the head as well as the gastro-intestinal tract if the body is not first located in this tract. The author believes that the anterior-poliomyelitis arose from the contiguity of the infection, or, at least, that it is plausible to believe that it did.

Medical Electricity, Roentgen Rays and Radium, with a Practical Chapter on Phototherapy. By Sinclair Tousey, M. D., consulting surgeon to St. Bartholomew's Clinic, New York City. Third edition. Thoroughly revised and greatly enlarged. Octavo of 1,337 pages with 861 practical illustrations, sixteen in colors. Philadelphia and London, W. B. Saunders Company, 1921. Cloth, \$10.00 net.

THE first twenty-four pages of this comprehensive work give a simple and lucid exposition of the nature of electricity.

Static electricity is then taken up, the first few pages explain insulation and conduction, describe the Leyden jar and discuss the nature of the electric spark. About twenty pages are given over to the description of static machines, their construction, size, care, and operation. A short exposition of electric units and of the sources of static electricity and tabulation of the physical effects is followed by ten pages devoted to methods of therapeutic application, and about the same space to a discussion of dosage.

About five times the space devoted to static electricity is then given to dynamic electricity—its nature, source, detection and measurement of currents all thoroughly discussed and explained. About thirty pages of this section deal with the alternating current. Electrolysis and the thermal effect of the electric current are elucidated.

Following this section twenty-five pages treat of electricity in animals and plants. Electric currents in the skin, the current of rest, the galvanic muscular wave, the Porret-phenomenon, currents of action, voltage and amperage of bio-electric currents, the wave of negative variation, local currents of action, electrotonus and the cause of animal electricity are taken up.

Next is a description of the physiologic effects of electricity upon microorganisms, vertebrates and their tissues.

The section dealing with electropathology contains reports of various fatalities from electrical apparatus, describes the pathological effects produced and explains the electrophysics of these accidents and lays down precautions to observe.

Materials for electrodes are briefly described.

In the section on electro-diagnosis the motor points of the body are illustrated by eight plates—normal and abnormal electric reactions, resistance of the body, laws of nerve stimulation, application of condenser discharge, and diagnosis of the eye, ear and neuritis are the topics here discussed.

About eight pages following this section are taken up with medication by electrolysis, galvanic, faradic and sinusoidal electrotherapy and electrotherapy in diseases of the nervous system, and a few of the special features of war injuries—these are constantly kept in mind throughout the sections on therapeutics and diagnosis.

High frequency currents, their description, application and effects are given one hundred pages.

The theory of ionization of gases and the passage of electricity through a vacuum are briefly treated, but sufficiently to give an intelligible idea to the reader.

The chapter on phototherapy (thirty pages) gives the principles of this method, describes the apparatus and recounts the chemic, bio-

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chemic, and physiologic effects of the ultra violet ray.

The history, properties and production of the x-rays take up the first one hundred pages of this section. The next three hundred pages deal with fluoroscopy and radiography, about two-thirds of this is given to specific technique and interpretation. The physiologic effects of the x-ray are discussed and precautions given. About ninety pages are given to roentgenotherapy in all its phases.

The history of radium, its cost, variations in radioactivity, the chemic and radiographic effects of radium, the theory of radioactivity, the physiologic effects upon microorganisms, plants and animals, and pathologic effects of radium are discussed in the first half of this section on radium and the last twenty pages of the section are given to radiotherapy under the headings of apparatus, dosage, lupus, skin disease, malignant disease, puncture for carcinoma, use of normal saline solution exposed to radiation, radium in eye disease, uterine fibroids, nervous diseases, tonic effect upon the heart, and substitutes for radium.

The index and table of contents are excellent.

The author is to be congratulated upon his achievement of a truly scientific book, so written that the intelligent layman with a general knowledge of the natural sciences can read it with enlightenment, though without full comprehension. To the roentgenologist not so thoroughly grounded in the physics of electricity as he would like to be and should be, but who has not yet forgotten or given up studious habits, this work is an invaluable aid—one feels more like saying an indispensable one.

Radio-Diagnosis of Pleuro-Pulmonary Affections. By F. Barjon. Translated by James Albert Honeij, M. D., Assistant Professor of Medicine, in Charge of Radiology, Yale School of Medicine. Cloth, octavo, 175 pages and index. Eighty illustrations, fifty-three of which are radiograms and twenty-seven diagrams. New Haven and New York City. Yale University Press, 1918, \$3.00.

THE author, while enthusiastic in regard to radio-diagnosis very strongly insists that a final and complete diagnosis is not within the province of radioscopy and urges close collaboration between physician and radiologist in these cases.

The classic and fundamental positions are described and procedures for complete as well as detached examinations are outlined.

Three chapters, sixty pages, take up the pathology and diagnostic interpretation of the pleurae under the following headings: pleurisy of the large cavity, circumscribed and encysted pleurisy, and pneumothorax.

The bronchi are taken up under the headings: foreign bodies, bronchial affections, tracheo-bronchial adenopathy.

The lungs are treated under the topics: vascular processes, acute infections, pulmonary processes (pneumonia, broncho-pneumonia,

pneumonic abscesses, gangrene), chronic pulmonary processes, and pulmonary tuberculosis to which about half of this section of fifty pages is given over. Lung tumors are discussed under cancer of the lung and pleurae, hydatid cysts of the lung and dermoid cysts of the thorax.

The last section (fifteen pages) is a chapter on penetrating wounds of the thorax by war projectiles. Clinical study, radiological study, indications and contra-indications for operation are discussed.

This book, first published in 1918, therefore not containing the very latest information on all details of this phase of radio-diagnosis, is an excellent work on the fundamentals of the subject. We wish that some one of our American authorities might be spurred to produce something as admirable upon the same subject.

Roentgen Interpretation. A Manual for Students and Practitioners. By George W. Holmes, M. D., Roentgenologist to the Massachusetts General Hospital and Instructor in Roentgenology, Harvard Medical School, and Howard E. Ruggles, M. D., Roentgenologist to the University of California Hospital and Clinical Professor of Roentgenology, University of California Medical School. Second Edition. Thoroughly revised. Octavo, 228 pages, 184 engravings. Philadelphia and New York. Lea and Febiger, 1921. Cloth, \$3.25.

THE second edition of this book is a further justification of the authors' purpose, as declared in the first, namely, to provide a "practical aid to those in search of a working knowledge of roentgen interpretation.

The roentgenologist's need of a thorough knowledge of anatomy and of clinical and surgical pathology is stressed and guiding axioms for diagnosis given.

The part played by calcifications, areas of increased density in spongy bone, warts, fibromata, metallic salts, gas and defective plates in producing misleading shadows is concisely given, are also anatomical variations.

The fundamental points in the diagnosis of fractures and dislocations are discussed, and under bone pathology the specific topics are osteomyelitis, tuberculosis, syphilis, typhoid, bone tumors and diseases of nutrition, the latter two are treated in specific detail. A tabulation of the findings in the more common bone lesions is given for use in differential diagnosis.

A separate chapter is given to the pathology of the skull and its contents, one to joints, tendons and bursae, one to the heart and lungs, one to the gastro-intestinal tract and one to the genito-urinary tract.

Fifteen of the one hundred and eighty-four illustrations are diagrammatic drawings to illustrate stomach pathology. The bibliographies appended at the end of each chapter give more than two hundred references to the literature, mostly American and British.

X-Rays and Radium in the Treatment of Diseases of the Skin. By George Miller MacKee, M. D., Assistant Professor of Dermatology and Syphilology, College of Physicians and Surgeons, Columbia University, Consulting Dermatologist and Syphilologist, St. Vincent's Hospital, New York City. Octavo, 602 pages, 250 engravings, 22 charts. Philadelphia and New York City. Lea and Febiger, 1921. Cloth, \$9.00.

THE need of thorough training, modern knowledge and equipment in present day roentgenological practice is noted in the opening chapter, and the fact that the pioneers in this field deserve a credit and homage sometimes forgotten by those who now enjoy the results of their labor, is dwelt upon at some length.

Following the historical sketch the electron theory of matter and the physics of the x-ray tube and rays are briefly expounded. The radio-active elements and their radiations are likewise reviewed.

The description, operation, and evaluation of x-ray apparatus is gone into in some detail throughout seventy-five pages. A chapter is given to pastilles and one to arithmetical computation of x-ray dosage. Roentgen ray technique, both filtered and unfiltered, and radium technique are thoroughly discussed in their general aspects.

The chemical, biochemical and biological effects of the roentgen rays and radium is the subject of a short but interesting chapter, tantalizingly suggestive of ultimate solution; the following chapter describes briefly the general effects of the roentgen ray and of radium upon the animal organs and tissues.

Two long chapters go into the detail of the clinical effects of these agents upon the normal skin, and the pathological histology of radiodermatitis. A general consideration of their action on pathological tissues follows in a later chapter. Idiosyncrasy is also given a chapter.

The last half of the book deals with the therapeutics of the following diseases and lesions: diseases due to pyogenic organisms, those due to fungi, eczema, psoriasis, lichen planus, pruritus, prurigo, diseases of the appendages, hypertrichosis, diseases of the hematopoietic system, those due (supposedly) to the tubercle bacillus, verrucous lesions and eruptions, nevi and congenital keratodermata, benign and malignant growths and miscellaneous affections.

The last chapter is of interest from the medico-legal point of view and contains suggestions of value to the practitioner inexperienced in this sometimes unpleasant aspect of his professional life.

This book is one which should be thoroughly mastered by every one practicing radiotherapy. The technique described is safe and satisfactory, and the fundamentals are discussed in such a way that all may obtain from it a good knowledge of the underlying principles of the radiotherapy of skin lesions.





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